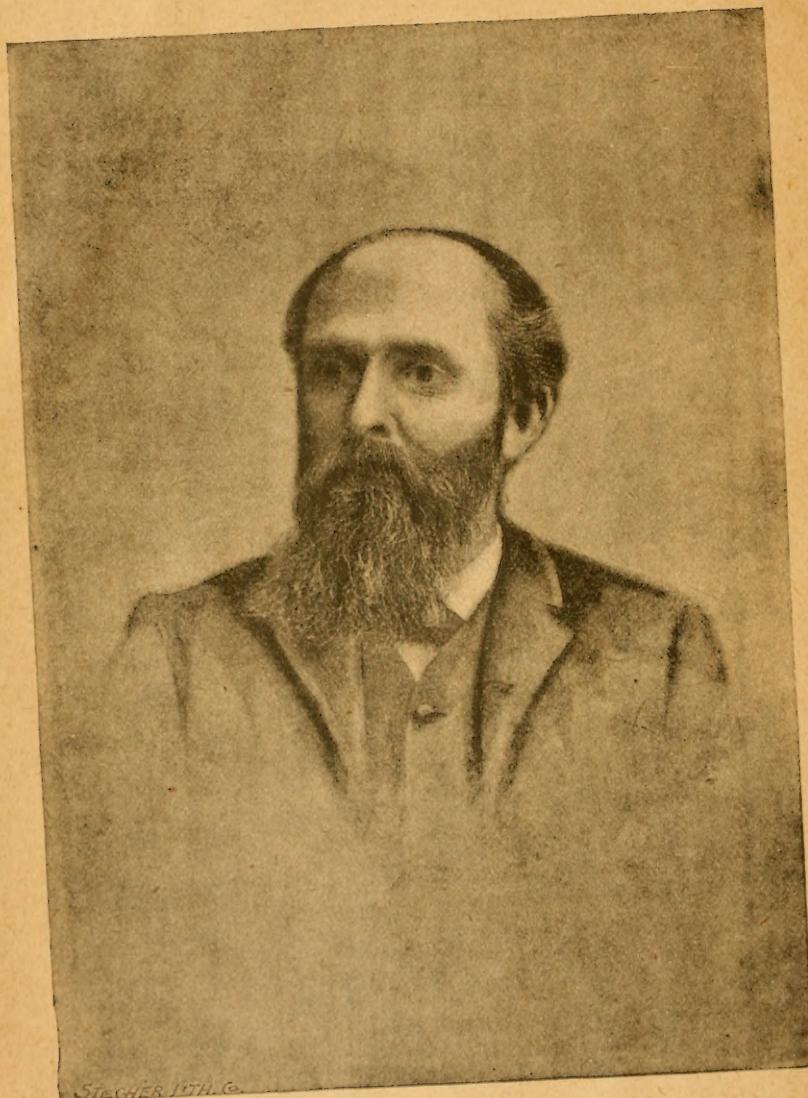




ANNUAL REPORTS
OF THE
FRUIT GROWERS' ASSOCIATION
AND
ENTOMOLOGICAL SOCIETY
OF ONTARIO.

1890.



A. M. SMITH,
President of the Fruit Growers' Association of Ontario for the year 1890.

SP
354
F9428
ENT

TWENTY-SECOND ANNUAL REPORT

OF THE

FRUIT GROWERS' ASSOCIATION

OF ONTARIO.

1890.

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY.



TORONTO:

PRINTED BY WARWICK & SONS, 68 & 70 FRONT STREET WEST
1891.

183583

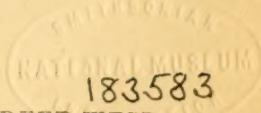


TABLE OF CONTENTS.

PAGE.	PAGE.		
Letter of Transmittal.....	v.	How to Prune a Commercial Orchard : A. McNeil, Windsor.....	37
Officers for 1891.....	vi.	A simple Way to make pure Grape Wine for Home Use : E. Gerardot, Windsor.....	39
The Annual Meeting.....	vi.	Fruit as Food : L. Woolverton, Grimsby	46
Treasurer's Report.....	vii.	Peach Growing in the Niagara District : L. Woolverton, Grimsby.....	56
President's Annual Address.....	vii.	Suitability of Ornamental Trees : D. Nichol, Cataraqui.....	60
Committees appointed at Annual Meet- ing.....	xiv.	Humbugs in Horticulture : T. H. Race, Mitchell.....	63
Report on New Fruits.....	xv.	The Curculio : Mr. Billings, Niagara...	72
The Winter Meeting.....	1	Pear Blight : J. K. McMichael, Water- ford.....	75
Vine Culture and Wine making in Essex.....	12	How to Make the best of Ten Acres of Land : E. Morden, Niagara Falls South.....	78
Experimental Farms: Wm. Saunders, Ottawa.....	13	The Ontario Fruit List	82
Fruit Rooms and Storage of Fruits : T. T. Lyon, President Michigan Horti- cultural Society	22		
Peach Growing for Profit : J. F. Taylor, Douglas, Michigan.....	25		
Experience in Pear Culture : J. K. Mc- Michael, Waterford	32		

INDEX.

Ammoniacal Carbonate of Copper	55
Apple Packing.....	76
Apple Scab	49, 54
Apples, Carbonate of Soda for.....	54
Apples for Stock.....	47
Apples, New—	
Beresinskoe	xvii.
Golden White.....	xvi.
Haliburton	xv.
Russian varieties imported, 1890 ..	xix.
Apples. Seedling—	
Henderson's	xvii.
McMillan's	xvi.
Renaud's.....	xvi.
Wilson's.....	xv.
Ashes for Gooseberry Mildew.....	51
Bassett's American plum.....	48
Ben Davis apple	7
Birch, Cut-leaved Weeping	61
Bradshaw plum	41, 42
Canadian Horticulturist, benefit of	ix.

Carbonate of Copper for Apple Scab ..	54
Carrying companies	71
Cherry, Clarke's September	xviii
Coal ashes as a fertilizer	37
Curculio	52, 72
" Paris Green for	53
Dry House.....	18
Essex, apples for	9
" Vine culture in	12
" As a Fruit section	16
Evaporated Fruit, galvanized trays for	20
" Growth and importance of the in- dustry	16
" Zinc in	21
Exhibitors, should they be owners	9
Experimental Farm.....	14
Experimental Grounds	1
Fameuse apple	5
Fertilizers for Orchards	35
Fruit as Food	46

PAGE.	PAGE.		
Fruit carriage	xii.	Peach Growing for Profit	25
Fruit Growers' Association, History of	viii.	Peach Growing in the Niagara District	56
Fruit Growing in Michigan	11	Peach Tree Borer	30
" n Niagara Peninsula	59	Peaches, Ashes for	29
Fruit Rooms, and Fruit Storage	22	" New varieties of	26
Fruit Varieties and Improvements	xiii.	" Six best for Essex Co.	30
Glass Seedling plum	42	" Six best for Niagara District	31
Golden Russet apple	5	" Yellows in	27
Gooseberry Mildew	49	Pear Blight	33, 75
Gooseberry, Sutherland's	xviii.	Pear Culture, Experience in	32, 81
Grand Duke plum	43	Peter's Yellow Gage plum	41
Grape Vine, pruning of	37	Pilfering Fruit	71
Grape Wine for Home Use	39	Planting Ornamental Trees	60
Greening apple	4	Planting unsuitable Trees	62
Grime's Golden apple	V 6	Plants for Testing	xi.
Handl ng Fruit	x.	Plums—	
Hedges for Southern Onta io	45	" Culture of	41
Horticulture in Schools	13	" Six best	41
Hudson River Purple Egg plum	41	" Three best for Home Use	43
Humbugs in Horticulture	63	Points in Peach Growing	56
Hypsulphite of Soda	54	Princess Louise apple	4
Imperial Gage plum	42	Pruning Grapes	37
Japan Plums	43	Pruning Norway Spruce	63
Judging Fruit at Fairs	22	Railway Freights	44
King apple	2	Red Canada apple	7
Lombard plum	41, 43	Reiné Claude plum	42
Mann apple	5	Russian Apricot	44
Marketing Fruits	68	Salome Apple	6, 44
Marketing Grapes	38	Saunders, Wm., Address of	13
Mice and Rabbits, Prevention of	34	Seedling Fruits	44
Mildew and other Fungi	36	Selling Fruit by Auction	69
McLaughlin plum	42	Shiawassee Beauty apple	6
New Fruits	xv.	Silver Poplar condemned	61
Northern Spy apple	3	Single Specimens of Ornamental Trees	60
Obituary Notices	xix.	Spitzenberg apple	5
John Croil	xii.	Spraying Trees in Bloom	34
Charles Gibb	xii.	" Mixture for	50
W. H. Mills	xii.	" Time for	35
One-Judge System at Fairs	22	Stark apple	4
Ontario Fruit List	1, 82, 84	Storage of Fruit	23
Ornamental Trees, Suitability of	60	Strawberry, The Williams	xvii.
Packages for Fruit	70	Ten Acres in Fruit, to make the best of	78
Paring Machines	19	Wild Black Cherry	61
		Williams' Strawberry	67
		Wine, pure	39
		Witch Hazel	26

ANNUAL REPORT

OF THE

ONTARIO FRUIT GROWERS' ASSOCIATION

TO THE HON. JOHN DRYDEN, MINISTER OF AGRICULTURE:

SIR—I have the honor of submitting for your approval the twenty-second Annual Report of the Fruit Growers' Association of Ontario.

In doing so, I beg that you will notice the efforts which are being made by our Association toward (1) the preparation of a complete list of fruits adapted to Canada with values of a perfect specimen of each variety attached, which it is hoped may form a basis for greater uniformity and fairness in judging fruits at fairs; and (2) the preparation of district fruit lists, which may serve as a useful guide to intending planters, by showing what varieties may be successfully grown in the various localities.

I have the honor to be, Sir,

Your obedient servant,

LINUS WOOLVERTON,
Secretary.

Grimsby, October, 1890.

OFFICERS FOR 1891.

PRESIDENT :

J. A. Morton Wingham

VICE-PRESIDENT :

A. H. Pettit Grimsby

SECRETARY-TREASURER AND EDITOR :

Linus Woolverton, M.A Grimsby.

DIRECTORS :

Division No. 1	W. S. Turner, Cornwall.
Division No. 2	John Craig, Experimental Farm, Ottawa.
Division No. 3	D. Nichol, Cataraqui.
Division No. 4	P. C. Dempsey, Trenton.
Division No. 5	Thomas Beall, Lindsay.
Division No. 6	W. E. Wellington, Toronto.
Division No. 7	M. Pettit, Winona.
Division No. 8	A. M. Smith, St. Catharines.
Division No. 9	J. K. McMichael, Waterford.
Division No. 10	A. McD. Allan, Goderich.
Division No. 11	T. H. Race, Mitchell.
Division No. 12	N. J. Clinton, Windsor.
Division No. 13	G. C. Caston, Craighurst.

AUDITORS :

James Goldie	Guelph.
J. M. Denton	London.

THE ANNUAL MEETING.

The annual meeting of the Fruit Growers' Association of Ontario, was held in the City Hall, Hamilton, on Tuesday evening, the 16th December, 1890.

The President, Mr. A. M. Smith, of St. Catharines, took the chair at 8 o'clock p.m., and introduced Mr. D. McLellan, mayor of the city, whose remarks are here reported in brief, owing to the absence of the official reporter.

The mayor said that when he received a letter from the secretary of the Association, asking for the use of the council chamber for this meeting, he had at once placed it before the city council, and it had received the hearty sanction of that body. He regretted that there was not that evening a larger local attendance of the citizens of Hamilton to show the interest they take in the progress of horticulture and agriculture in our country. He thought that the Association had done a wise thing in choosing the city of Hamilton as their place of meeting, because this city was situated in the very heart of the best fruit region of Ontario, and near to the Niagara district, which is so well and so favorably known on account of its great adaptability to the culture of our finest varieties of fruits. By such meetings as these, and through the interesting and valuable reports of them which were scattered so widely by the Department of Agriculture, the Association was advertising the capabilities of this province throughout the whole world. The agricultural delegates of the British farmers who had recently visited this country, had carried away with them the most favorable impressions of the agricultural and horticultural resources of this province. He was aware that no very lengthened address was expected of him at this time, and he would therefore simply extend to the Association a most hearty welcome on behalf of the citizens of Hamilton.

The President replied on behalf of this Association, thanking his worship the mayor, and through him the citizens of Hamilton generally, for the kind welcome, which had just been extended to them. On coming to this city the society felt that they were in a sense only coming home again, for it was its birthplace, and for this reason, as well as because of the general interest always manifested here in their work, the members felt more at home than in any other city in the province. The president closed his remarks with some complimentary expressions regarding the beauty of the hall which the city had so freely placed at the disposal of the association.

THE TREASURER'S REPORT.

After the minutes of the last annual meeting were read the Treasurer's report was presented as follows :

RECEIPTS.	EXPENDITURE.		
	\$ c.	\$ c.	
Balance on hand last audit.....	231 86	Plant distribution	291 86
Members' fees	2,012 35	Canadian Horticulturist.....	1,598 01
Government grant	1,800 00	Chromo lithographs	233 00
Advertisements.....	296 87	Electrotypes	73 78
Back numbers and bound volumes of the Canadian Horticulturist.....	43 18	Directors' expenses	464 36
Petty receipts	1 17	Express and duty	230 45
		Printing and stationery	76 38
		Postage and telegrams	85 61
		Commissions	85 08
		Care of rooms at meetings	12 60
		Stenographer	128 15
		Discounts	14 05
		Exchanges	4 60
		Advertising meetings	3 00
		Salary Secretary-Treasurer, Editor and office clerk	1,000 00
		Balance on hand.....	84 50
	4,385 43		4,385 43

To the President and Directors of the Fruit Growers Association :

GENTLEMEN,—We, the undersigned, appointed to audit the receipts and disbursements of the Secretary-Treasurer for the year ending December, 1890, beg to present the following report:

We have examined the vouchers, compared them with the items of expenditure, and find them correct, showing a balance deposited in the Canadian Bank of Commerce, Hamilton, of \$84.50.

Your auditors wish to bear testimony to the careful manner in which the books of the Association are kept.

JAS. GOLDIE, }
J. M. DENTON, } Auditors.

HAMILTON, December 16th, 1890.

Upon motion the treasurer's statement and the audit thereof were duly adopted.

THE PRESIDENT'S ANNUAL ADDRESS.

GENTLEMEN,—In pursuance of a time-honored custom it becomes my duty to review the labors of another year, or in other words to give an account of our stewardship, and to present some thoughts upon horticultural topics that may be of interest. Although the origin and advancement of our association has frequently been alluded to in the annual addresses of my predecessors in office, I feel that it would not be out of place in again meeting here in the birthplace of our society, to glance a little farther back than over the year which has just passed, to the time when our existence began and note the progress and advancement we have made.

Nearly thirty-two years ago, or, on the 19th of January, 1859, in the board room of the Mechanic's Hall in this city, was organized what was then called the Fruit Growers' Association for Upper Canada; which name was afterwards changed to the Fruit Growers' Association of Ontario. The late Judge Campbell of Niagara was its first President. He died within a year and there was no re-election of officers till the 16th of

January, 1861, though there was a meeting for show of fruit and discussion of fruit topics in October previous, at which time my connection with this association began. I think I have only been absent from two of its annual and five or six of its other meetings since that time. There were seventeen members at this meeting, quite a show of fruit, and a good display of enthusiasm, besides some rambling discussion, and it was decided to hold a meeting for the election of officers on the 16th of January following, which was accordingly held. At this meeting the late Judge Logie, of Hamilton, was elected president, which office he held till the year 1867, when he was succeeded by the late Wm. H. Mills, of this city. During this period meetings were held two or three times a year, at various places, for show of fruits and discussions upon topics connected with fruit culture, which brought out a great amount of useful information and no doubt helped to lay the foundation of success in fruit culture which followed, though the meetings were often but poorly attended, and the membership of the society had only increased to thirty members. Fruit growing for profit was little thought of in Canada at that time, except by a few persons in the Niagara district, and a few other favored localities. In fact it was a question in many parts of the country, where fruit is now grown largely for market, whether it could be grown at all or not. Many had planted different varieties in many localities on the recommendation of traveling agents which were not adapted to the country and their failure had discouraged them and others from planting. During the year 1868, through the efforts of Mr. Mills and his co-laborers, the society was incorporated under the Society and Arts Act, and became entitled to receive from the public funds a yearly grant of \$350. This enabled us to collate, publish and distribute the information gathered in our society and also adopt a system of sending out plants and trees to the different members in various parts of the province for trial, and this has been productive of a vast amount of good in showing what varieties are and what are not adapted to different localities. From that time forward, our labor have been a continual success. We have held our meetings in nearly every part of the province, thus arousing local interest in the work, and encouraging farmers and others to plant fruit. The Government, seeing our good works, have from time to time increased our grant to enable us to carry out special plans for the advancement of this interest; notably our exhibits of fruit at the Centennial Exhibition in Philadelphia and the Colonial in England, which did more to attract attention to Canadian fruits and place them in the position they now occupy, in the front rank of the best markets of the world, than all other causes combined. In thus attracting attention to Canada as a fruit country it would naturally be suggested that a climate adapted to fruit growing would be a desirable one to live in and thus I have not the least doubt that we have been instrumental in bringing many settlers from other countries to Canada.

Another scheme, which our Government grant has enabled us to carry out, has been the publishing of our *Canadian Horticulturist*, a medium through which a vast fund of useful information is conveyed to our members and many of the general public besides, and under the management of its present efficient editor it is constantly growing better and its usefulness is extending. I need not say this to the members, who all receive it, but to those here who are not members I would say join our association, if for no other reason than in order that you may have the *Canadian Horticulturist*.

Our membership has increased from the little group of 30, in 1868, to over 2,000, and we have the proud satisfaction of being the largest horticultural society in America, if not in the whole world; while the culture of fruit throughout the country has made corresponding advancement. Our towns and cities which were formerly largely supplied from the neighboring republic are now abundantly stocked with fruits of our own growing, and many sections of our country to which apples were sent from the States and Niagara district thirty years ago, are now exporting thousands of barrels annually to the old country, and even to the United States, and that of a quality, too, which can not be excelled or even equalled in the whole world. And by careful hybridizing and judicious selections, varieties have been found that will succeed in many sections where it was thought fruit could not be grown, and, if experiments and plans which are now under way succeed, and I have every confidence that they will, the day is not far distant when every inhabitant of Ontario, if not of the Dominion, who has land capable of being tilled, if he cannot sit "under his own vine and fig tree" may at least, if he choose, raise enough of some kinds of fruit to supply his own table.

Great improvements have been made also in the methods of handling fruits and in packages. Thirty years ago, when I used to attend the Hamilton market, berries of all kinds were brought in in pans and pails, and dipped out with the hand or with ladles into measures, often in a condition ready for jam. Apples, pears and sometimes peaches if not too soft were marketed in grain or meal bags, which had frequently not been very well shaken—the bags I mean—the fruit had plenty in being got off the trees and over the rough roads in lumber wagons—there were no express offices between St. Catharines and Hamilton, or that place and Toronto, I think; but now we have attractive baskets and packages for every kind of fruit and it is carefully conveyed in spring wagons to the railway station where express agents are ready to receive and forward it to its destination. But, notwithstanding the progress of fruit culture there have been many discouragements and hindrances to contend with. Blight, fungus, mildew, yellows, black-knot, frost and insects of various kinds, often step in and cut off our crops and blast the hopes of fruit growers, and they have to be ever on the alert to protect themselves from these enemies. The methods and experiments in combatting these evils, brought out in discussions at our various meetings and communicated to the public and others, through our *Horticulturist* and Annual Report, have been of incalculable benefit. There has not only been a great advance in fruit growing during the last thirty years but also a great advance along all other horticultural lines, particularly in the rural districts. There is more taste displayed in laying out and beautifying grounds, in planting trees, shrubs and flowers; in making homes attractive, than previously, and we believe that the Fruit Growers' Association of Ontario has done much in the development of this taste and in bringing about these excellent results. The year that has just passed, has been a very discouraging one to many of us, particularly to growers of apples. Although the spring opened with an abundance of bloom and there was every indication of a bountiful crop, there came a cold east storm which blasted the fruit and entirely destroyed it through the middle and southern portions of Ontario, except in a few sheltered and favored locations. The counties of Huron, Bruce, Grey and a portion of Simcoe were the only ones which had any apples of any account to export. The same storm nearly destroyed the

peach crop also, and in many sections the plum and cherry. Pears have been a medium crop, and the grape crop simply enormous, yielding five to six tons to the acre and some varieties even as high as eight to ten tons. Small fruits have been a fair crop and all kinds of fruit have brought good prices. On the whole, fruit growers have been as successful as any other class of agriculturists. I think, however, that this season will demonstrate the fact that it is not wise for those whose only income is from fruit, to depend altogether upon one kind. "Don't put all of your eggs in one basket." Many an orchardist, who has depended solely upon his apples or peaches this past year, finds himself in a bad position, while those who have had an assortment of fruits have had something to fall back upon.

Now a word about our labors for the past year. Besides the issuing of our *Horticulturist* and annual report, we have arranged a list of the varieties of apples adapted to Ontario, showing their relative values, hardiness, productiveness, quality etc., establishing a scale of points for judging fruit at fairs, which we think will be of great value; we have held two meetings for the show of fruits and discussions a full account of which will appear in our next annual report. These meetings have been well attended by our own members and their friends, besides we have had several prominent horticulturists from the United States to give us the benefit of their experience, so that, altogether, the report of 1890 may be looked for as one of great value. We have distributed over 2,000 trees, vines, and plants to our members for trial, and let me here emphasize that word *trial*, for I fear too many of our members think these trees and plants are given just as an inducement for them to become members, or as a gift, and as they cost them nothing they do not give them the care and attention they should. This is not the object for which they are given; they are given you for *trial*. They are generally new and untried varieties and we wish to have them tested in different sections of the country and upon different soils and locations and careful reports made upon them for the good of the country at large. So, if they are valuable, others can plant them and if they are not suited to one section, let it be known, so that others in that section will avoid planting them. We consider that you get your dollar's worth from the *Horticulturist* and report and that you should do this testing for the good of others.

Another work which many of the prominent members of the association have been engaged in and which I think will be productive of much good, has been the visiting of farmers' institutes throughout the province and taking part in the discussions upon horticultural subjects, imparting what information they could in relation to fruit growing. During the year we have had a Dominion convention of fruit growers which many of our members attended, and at which many questions of interest were discussed.

Perhaps the most important was that of shipping and marketing. Agents of different transportation companies met us and listened to our grievances and suggestions, and they manifested a desire to furnish us better facilities and greater dispatch in shipping our fruits. I believe, as a result, there has been an improvement in this respect during the year, though I think we have just cause to complain yet of the way our fruit is handled by some of the express companies, and their want of proper accommodation in their cars, which are generally destitute of shelves for storing fruit. Slight baskets

are piled one upon the other in such a way that frequently when it comes off the car it is in better condition for pigs than for placing upon the market. There is another grievance in connection with the express companies which I think it the duty of this Association to look into and try to have remedied. I refer to the petty pilfering of fruit from baskets and packages while in transit. I presume there is not a shipper who does not receive complaints every year from his customers of weight or measure being short, or baskets being broken open and fruit abstracted. The loss is generally so small that if he is very busy he does not take the trouble to report it, and if he does he seldom gets any satisfaction. The large shippers do not often notice it, but it comes especially severe on the small dealers in country towns and private individuals who are getting a few baskets for their own consumption. As a case in point, I was stopping a few weeks in the little town of Brussels last fall during the grape season, and a *widow woman* living there who made her living by selling fruit and confectionery wanted me to order her up some grapes for retailing, 100 pounds or so at a time. I did so and when the first lot came up she reported them five or six pounds short. Thinking there might possibly be a mistake on the part of my shippers I deducted it from her bill and let it pass. On the arrival of the next shipment I happened to be in her store when they were delivered and noticed that some of the baskets had been broken open. I took one and weighed it and found that there had been stolen over three pounds by actual weight. I showed it to the agent and he reported it to the superintendent of the company, and that is the last I have heard about it. There was from 20 to 30 cents' worth on each shipment taken from this poor woman's hard earnings which would in two or three weeks amount to several dollars and she had no means of redress. If there had been that amount taken from a money or from any other package of value there would have been an investigation and restitution, and the guilty parties punished. Why should not property in fruit be respected as well as in any other commodity? I trust there will be a committee appointed to look into and remedy this evil.

While we congratulate ourselves upon the achievements of the past we must not forget the duties of the present. There are many evils to remedy, wrongs to be righted, errors to be corrected, in the horticultural line as well as in others, and while we have made advancement in the past we must not forget that we are far from what we ought to be considering our advantages. There is not a country in the civilised world that has a better soil and climate for growing apples, pears, plums, cherries and many varieties of grapes in perfection than we have, to say nothing of small fruits, yet there is not one farmer in ten, take Ontario through, that grows half of these fruits required for his own use even. I have travelled through some of the best fruit sections of the province during the past year, been upon the farms of some of our most prosperous farmers and enjoyed the hospitality of their homes, and I was surprised at their want of horticultural taste and knowledge. Even where every other surrounding was all that could be desired, as good buildings and fences, good horses and cattle, good roots and grain, well tilled fields, yet when you looked for the orchard, the fruit or the flower garden or the lawn, they were either wanting or in a very neglected condition; and while their tables were well supplied with the substantial and luxuries of other kinds, there was a noticeable absence

of what, to me, is an indispensable diet—fruit. I may be wrong in my ideas about food but I have often thought that if farmers would eat less fat pork and more fruit they would be healthier and happier if not better looking than they are. This would certainly be the case if there is truth in the adage that “like begets like.” But about the healthfulness of fruit, there can be no doubt about the elevating influence of horticultural pursuits, and I believe it to be the duty of every member of this Association to do all he can to interest and instruct his neighbors in these pursuits both by precept and example. Show them your own well-kept grounds stocked with the best trees, shrubs and plants that your means will afford, give them a taste of your best fruits, ask them to attend our meetings, show them *The Canadian Horticulturist* and annual report, and persuade them to become members of our Association. I believe if our farmers could be induced to take more interest in these things, and surround their homes with these attractions, we should hear less complaints about their sons and daughters leaving the farm to engage in other pursuits. Perhaps I am taxing your patience, still I would like to say a word in regard to varieties of fruits and their improvement.

If we look over the thirty years of the past we can recollect a great many varieties, particularly of grapes and small fruits, that have been introduced to us with a “great flourish of trumpets” by their friends or persons interested in the sale of the plants, which have been received and cared for at great expense, and we have found that a majority of them, like some of the human species, have not improved on acquaintance, and we have been obliged to discard them, while a comparative few have come to stay, and are an improvement on the older varieties. These have amply repaid us for the time and money bestowed upon them, still we can but feel that this continual testing of new varieties is a constant strain upon our time and purse, and as testing new fruits is a work that benefits the whole country I do not see why our government should not assist us in this work. But it may be said by some that we have agricultural and experimental farms already for doing this work, at Guelph and Ottawa. I would ask what can be done at either of these places in testing tender varieties of apples, pears, plums or cherries, much less grapes, peaches, apricots, nectrines, etc.? I know that Professor Saunders and his staff are doing a great work in bringing out varieties adapted to the colder parts of the province, and his experiments in hybridizing strawberries, raspberries, gooseberries, currants, etc., will undoubtedly be of great benefit to us here. I had the pleasure, during the raspberry season, of visiting the experimental farm at Ottawa and seeing some of the marvellous results of his labors and testing. Of the hundreds of varieties of this delicious fruit which he has produced by hybridizing and the careful selection of varieties, and I have no hesitation in saying that many will prove superior in many respects to anything that we now have in cultivation, and I think the same will prove true in many other of his fruits. I sincerely believe that the results he has already achieved will more than pay the country for all the expenses incurred in the horticultural department of the experimental farm, and his work has but just begun. I believe if we had an experimental ground carefully conducted somewhere in Southern Ontario, where our tender fruit trees, shrubs and plants could be grown and tested, and where only varieties that were worthy of cultivation would be recommended, it would be a great

boon to the country, and in 30 years more we would make much more rapid advances in the improvement of varieties than we have in the past. I hope that a committee will be appointed by this Association to interview the Government upon this subject.

It gives me much pleasure to meet my co-laborers here in the city of Hamilton again, and although I do not see many faces that I met here thirty years ago, it reminds me of them and of the many pleasant meetings we have had here. It reminds me too that many of them have passed away. Only a few of the original founders of this society are left; their places have been filled by other workers, and some of them have been called also. During the past year we have lost one from our board of Directors whose genial, kindly face will be missed by all; ever active in the discharge of duty, cheerful, jovial and true as a friend, the name of John Croil will ever be revered by the members of this Association. We have sustained another great loss in the death of Wm. H. Mills of this city. It was largely through his efforts that we became incorporated and received the Government grant, and although since his retirement from office he has not taken an active part in our meetings, he has had a deep interest in our success, labors and welfare as evinced in his generous donation of his entire stock of his hybrid grape, the Mills, which will be distributed to the members of the Association next spring. Not only this Association but the horticultural world has met with a great loss in the death of Charles Gibb, of Abbotsford, Quebec, whose whole life was devoted to this pursuit, and whose labors and researches have done more to secure fruits adapted to the colder parts of our country than those of any other man. Another prominent horticulturist across the line, to whom we are much indebted and whom many of us knew, and whom to know was to respect and love, and who has done as much probably for this cause as any man in the United States, has gone. I refer to Patrick Barry of Rochester, N.Y., who has long been the honored president of the Western New York Horticultural Society. We mourn with them his loss. Thus one after another of our workers pass away, but the fruits of their labors live after them—more enduring monuments than those of marble or granite—to perpetuate their memory. May their mantle fall on us, and when our work here is finished may those who are left behind point to some rich results of our labors.

On motion it was resolved that this Association hereby express its appreciation of the excellent address just given by the President, and refer the points touched upon to the consideration of a committee hereafter to be appointed.

COMMITTEES.

A nominating committee was appointed to nominate the officers for the coming year, consisting of Messrs. M. Pettit and D. Nichol appointed by the chair, and Messrs. P. C. Dempsey, W. E. Wellington and J. K. Leslie appointed by the meeting. This committee reported as follows:—

President—J. A. Morton. Vice-President—A. H. Pettit. Directors—1, W. S. Turner; 2, John Craig; 3, D. Nichol; 4, P. C. Dempsey; 5, Thos. Beall; 6, W. E. Wellington; 7, M. Pettit; 8, A. M. Smith; 9, J. K. McMichael; 10, A. McD Allan; 11, T. H. Race; 12, N. J. Clinton; 13, G. C. Caston. Auditors—Jas. Goldie and J. M. Denton. After these names had been voted upon *seriatim* the report was adopted.

At a meeting of the directors held subsequent to the election, L. Woolverton, of Grimsby, was re-appointed secretary-treasurer and editor of the *Canadian Horticulturist*.

The following committees were appointed by the chair, viz.:

Fruit Exhibit.—A. McD Allan, John Craig and A. Alexander. *Legislation*.—T. Beall, P. E. Bucke and G. C. Caston. *New Fruits*.—W. E. Wellington, M. Pettit and A. M. Smith. *Special*.—P. C. Dempsey, Jas. Goldie and the secretary.

Communications were read from Prof. Saunders, regretting that he could not arrange to be present, from the Hon. J. M. Gibson and the Minister of Agriculture and others expressing their intention of being present.

The Secretary stated that he had received a letter also from the Department of Agriculture, to the effect that it was the intention of the department to bind in cloth a sufficient number of copies of the report to supply all actual members of the association. This statement was received with great satisfaction.

REPORT ON NEW FRUITS.

The following paper on new fruits, that have been brought under his notice, was read by the Secretary:

It will be gratifying to the board of directors, and others interested, to know that some work is being done each year by our association in recording the origination of new and promising varieties of Canadian fruits, as well as in testing the suitability of highly commended varieties of foreign origin.

In apples particularly, there have been quite a number of very promising varieties sent in to me for my opinion, some of which I have forwarded on to the other members of the Committee, and others I have noticed in the *Canadian Horticulturist* without that precaution. I will now give you a list of these, in order that a record of them may be kept in our report, pending farther test of their merits.

WILSON'S SEEDLING.—A magnificent fall apple of very large size and fine color, found growing by the kitchen door in Mr. B. Willson's yard in Wingham, and sent in by Mr. J. A. Morton. The tree grows vigorously, and has a rather compact, bushy head.

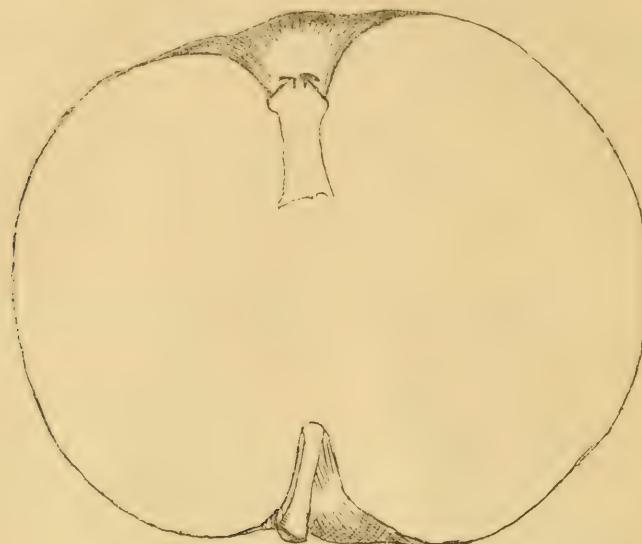
Description.—Size, very large; form, conical; skin, yellowish, spattered and shaded with very bright red on the sunny side; stem, set in a moderately deep, even basin; flesh, yellowish white, somewhat inclined to water core, tender and of a pleasant flavor. A good cooking apple. Season, October.

THE HALIBURTON.—This apple was sent me by Messrs. Cavers Bros., of Galt, for an opinion. It appears to be a local apple grown for some years in the township of Haliburton, under that name, and possesses sufficient beauty of appearance to merit notice. The description of the apple given below was prepared by Prof. Saunders.

Grown north of Peterboro', size medium or under, $2\frac{1}{2} \times 2\frac{1}{8}$, form oblate, color pale yellow, nearly obscured on the side exposed to the sun by carmine red, marked with splashes and streaks of a deeper hue. Stalk short and moderately stout, set in a small but rather deep cavity, calyx open with a very shallow smooth basin. Flesh fine grained, creamy white and more or less tinged with pink, rather soft in texture, austere and with an acid taste, with very little flavor, a pretty apple, but of poor quality. Ripe latter end of September.

GREEN FAMEUSE.—An apple sent me by Mr. R. W. Shepherd, jr., of Montreal. He says the original tree is some twenty-five years of age, and is growing on his farm at Como. The fruit is larger than the Famouse proper, and he describes it as being a heavy bearer, and very little, if, any given to spotting. In other respects it seems to have all the qualities of the Famouse as generally known, with the exception of color. This seems to be its chief lack to make it very desirable.

RENAUD'S SEEDLING.—A winter apple of great promise, sent in by Mr. Robert Hamilton, of Grenville, P.Q. It is a chance seedling, found growing on the farm of Mrs. Renaud, Grenville, and is now about eighteen or twenty years old, a fact which points out its undeniable hardiness, for Grenville is about north latitude $45\frac{1}{2}$, on a line with the Parry Sound district. We have for this latitude plenty of good fall apples, but a real first-class winter apple is the desideratum. Possibly in this seedling the want may be supplied. The apple appeared to me to possess four important points of excellence, viz:—size, beauty, productiveness and hardiness. I have therefore made a drawing of a section of it to give some idea of its exact size and shape.



SECTION OF RENAUD'S SEEDLING.

Description.—Size, large; form, roundish, with three or four more or less prominent ribs; skin, green, almost completely striped and splashed with bright red; stem, medium, in a small snug cavity; calyx closed, in a smooth regular basin of moderate size; flesh creamy white, firm, of a pleasant vinous flavor; quality, good; season, March to July.

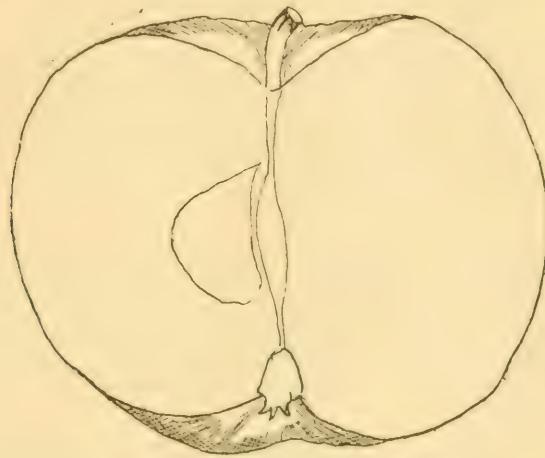
McMILLAN'S SEEDLING.—This apple, sent me by Mr. J. P. Cockburn, Gravenhurst, originated in the county of Stormont, latitude nearly 46° , and is the product of a seedling tree twenty years planted. It evidently has the merit of hardiness, and it is for a list of hardy apples that we can commend that we are at present looking. It is a fine looking fall apple, and would be an ornament to any table for the dessert dish. One great point in its favor, for these days, is that it does not appear to have the least tendency to spot, a grievous fault with many of our otherwise excellent dessert apples.

Description.—Size, medium; form, oblong; skin, yellowish white, almost completely blottedched and dashed with bright red, much deeper on the sunny side; stem, slender, three-quarters of an inch in length, set in a deep, narrow cavity; calyx closed in a very small wrinkled basin; core open and seeds free; flesh, white tinged with pink, prominently marked toward the apex, tender, mellow, fine grained, not very juicy, with a good flavor, somewhat of the *Fameuse* character; season, October. Promising.

THE GOLDEN WHITE.—I have received from R. Brodie, Montreal, two fine samples of the Golden White, one of the most promising Russian apples. It compares favorably in beauty with the *Duchess of Oldenburgh*, ripens later in the season, about the first of October, is rather large in size and would sell at top prices in our markets. Surely if our friends in the northern sections can grow such apples as *Yellow Transparent*, *Duchess of Oldenburgh*, *Golden White*, *La Rue*, *Wealthy* and *Renaud's Seedling* they have as good prospects for success in apple culture as we who live in more favored sections.

Professor Saunders, director of the Experimental Farm, Ottawa, describes this apple as follows:—Golden White, from Montreal, said to be of Russian origin. Size large, $3\frac{1}{4} \times 3\frac{1}{2}$, form nearly round, unevenly ribbed, color reddish yellow but almost concealed by pale red with numerous splashes and streaks of deeper red in which are many pale dots, stalks short and fairly robust, cavity small but deep, calyx of medium size, partly open in a rather strongly ribbed basin; highly perfumed; fresh creamy white with a slight tinge of pink, rather soft and a little coarse in the grain, crisp and moderately juicy, mildly acid and highly flavored; quality good; core of medium size. A pleasant apple to eat and would no doubt cook well. Ripe latter end of September.

HENDERSON'S SEEDLING.—Mr. G. G. Henderson, of Hamilton, sent in to me a very pretty apple, which he says is a splendid keeper. It certainly is an apple possessed of excellent flavor and if it averages on the tree anything like the sample sent in to me it is worthy of a place among our winter dessert apples. I have drawn a section of it to accompany this paper.



SECTION OF HENDERSON'S SEEDLING.

Description.—Size medium, form oblate, regular, except that it is obscurely ribbed skin a beautiful creamy white, ground striped and splashed with pink, shading into a deep red on the sunny half; calyx closed, set in a medium sized, somewhat rugged basin; stem very short, in a broad shallow cavity; flesh snow white, tender, juicy, with delicate aromatic flavor; quality very good. A winter apple, exact season not determined. A sample of this apple shown at our winter meeting was much inferior to the one first sent me from which the above description was prepared.

RUSSIAN APPLE BERESINSKOE.—Distributed in 1885. Mr. F. W. Coate, of Cape Elizabeth, Rosseau, sent me this apple saying with the following note:—“In 1885 I selected from the Fruit Growers' Association's list of premium plants a Russian apple tree, Beresinskoe. I received and planted the little tree on the 13th May. This year it has borne for the first time 17 apples. I send you by mail six of them that you may judge if the beauty and quality of the fruit is worth notice in *The Horticulturist*. This apple is described by Prof. Saunders as follows:—Beresinskoe (?) probably Beresinskoe—Beresina. Size medium, $2\frac{1}{2} \times 2\frac{1}{2}$, form nearly oblong, color pale greenish yellow, with a bright red shading on the part exposed to the sun, and a few dots and streaks of deeper red. Stem long and rather slender and set in a moderately deep cavity, calyx nearly closed, in a shallow, strongly ribbed basin. Flesh yellowish white, more or less water-cored, of moderately fine texture, a mild, nearly sweet character, with an agreeable but

not high flavor. Core large. The specimens are too ripe to admit of accurate judgment as to quality, but it would probably be entitled to rank as good. A pretty apple, would make a nice dessert fruit and would probably cook well.

CLARK'S SEPTEMBER CHERRY.—Mr. E. D. Arnaud, of Annapolis, N. S., sent me a box containing some samples of this singular cherry in excellent condition, considering their long journey. There is but a single tree and it is growing at Lower Granville, near Annapolis. The fruit is about the size and shape of the Kentish and when fully ripe of a dark red color. The flesh is firm and of a sweet and very agreeable flavor. It might be a very valuable shipping cherry.

THE WILLIAM'S STRAWBERRY.—In small fruits there is little to report. One strawberry of considerable apparent merit has come to the front under the name of the Williams. Samples of this berry were sent me by Mr. David Grey, of Canesville, and afterwards some were shown at our meeting at Niagara by Mr. Lee, of Virgil. It was raised by a Mr. Williams, of Burford and among strawberry growers in Brant county it has by all accounts become very popular. It is said to have been raised from the Crescent seedling, fertilized with Sharpless. It is said to be an enormous bearer of very large berries which must be allowed to ripen well before gathering or it will show some traces of the white tips of its male parent. Compared with Sharpless it is claimed that it will bear four times as heavily; it is also stated by Brantford growers that the berries are as large as those of the Jessie, and that the plant is much harder. Certainly from the samples sent me and those shown at our meeting this berry has considerable merit, and, in order that it may be further tested it has been placed on our list for distribution in the spring of 1891.

SUTHERLAND'S SEEDLING GOOSEBERRY.—Samples of this gooseberry were sent me by the originator, Mr. George Sutherland, of Meaford. It is a seedling probably of the Downing. It has borne four crops and so far has proved itself to be an enormous cropper and free from any sign of mildew. The bush is a strong, upright grower and the berries are large and light green in color. I was not very favorably impressed with its quality, still it might be a profitable berry to grow for market where fruits so often sell more by appearance than by quality.

OUR RUSSIAN IMPORTATION.—Not the least important of our labors during the past year in the introduction of promising new fruits is our Russian exchange. Through our Russian friend and correspondent Mr. Jaroslav Niemetz, of Rovno, Wolinia, Russia, who, I may add, has himself become a member of our association, I have succeeded in obtaining a large box of scions of the best varieties of Russian apples, pears, apricots, etc. In order that we may make an independent test of their value the greater part of these importations I have placed in charge of the Central Experiment Farm for propagation and testing on condition of our receiving a reasonable share for distribution.

I am just in receipt of a communication from Mr. John Craig, horticulturist of that farm, in which he gives a full list of the varieties I have sent him and the number of grafts of each kind he has succeeded in raising. I subjoin this list in full from which it will be seen that there are some three hundred and sixty young apple trees growing, sixty eight pear and fifteen plum trees.

Among the apples Mr. Niemetz has especially called our attention in the *Canadian Horticulturist* to the Antonovkas and the Synaps. He also sends an apricot which he regards as the most hardy that is known in Russia. It is called the Anjustin's apricot and has been fully treated of in our journal, where he shows that more hardiness may be expected to characterize it than does the Russian varieties that were brought over by the Mennonites. There were also a lot of 50 small cherry trees of a variety called Koslov Morello, which have also been described in our journal. Forty of these also have been passed over to the Central Experimental Farm for propagation and testing. Should they prove valuable for northern Ontario steps will be taken to secure a sufficient number in the course of time for distribution to our members.

List of one year old grafts from scions imported from Russia by the Fruit Growers' Association of Ontario, spring of 1890 and propagated by Mr. John Craig, of the Central Experimental farm, Ottawa.—

Stone Antonovka	Gov't Tchernigov	36
" "	Koslov.	1
White "	"	7
Antonovka	Grell.	2
"	Ansjustin.	10
"	" 15 A.	4
"	" 15 B.	9
Aport	Solovieff.	7
"	Grell.	20
Arkad.	"	56
"	Solovieff.	17
Bieloi naliiv.	Grell.	25
Naliiv.	Solovieff.	21
Korobov.	Ansjustin.	10
Skrisch apple.	Solovieff.	16
Miron.	Grell.	14
Skrut.	"	17
Lebedka.	"	18
Koritchnevoc.		62
Miron.	Solovieff	39
Gul pembe	Niemetz	43
Golden Stone.	"	20
Borodovka.	"	25
Dvinnoe.	Solovieff.	18
Putim 37 B govt of.	Tchernigov.	23
" 36 A	"	12
Putim.	Koslov.	6
Lapouche.	"	2
Pana.	Niemetz.	15
Paperovka.		3
Russian Tyrol.		11
Stekhanka.		36
Zolotoreff.		13
Chelibi.	Niemetz.	12
Sommitschnoe.	Grell.	15
Plodovitka.	Koslov.	45
Plodovitka.	Solovieff.	95
Anis.	Grell.	19
Naliiv.	Ansjustin.	0
Grushevka.	Solovieff.	10
Kara—Synap A.	Niemetz.	16
Kara—Synap B.	"	32
Sari—Synap.	"	63
Skrosunna.	Grell.	92
Sklanka.		8
Vargulok.		24
Plikanoff.		3
Titovka.	Koslov.	81
Titovka.	Solovieff	99
Without name.	"	9
Name lost.		19
Gremnick.	Niemetz	6
Borovinka.		6
<i>Pear.</i> —Ukraine Bergamotte.		17
Hamburg " and Ogust excell (mixed).		8
Krasorka.		6
Ilinka.		6
Gleck.		1
Salviate.	Ansjustin.	23
<i>Plum.</i> —Niemetz.		24
		15

REPORT OF THE SPECIAL COMMITTEE.

The following report was handed in by the Special Committee :

Whereas, during the past year, the horticultural interests of our country have sustained a serious loss in the death of three prominent Canadian horticulturists, namely, Mr. Charles Gibb, of Abbotsford, Que., a scientific student and experimenter, who by his travels and researches has already very much enriched our Canadian literature and whose death in the prime of life occurred at Cairo, in Egypt last March ; Mr. W. H. Mills of Hamilton, a former president of our Association, whose labors, as a hybridist, have

rendered his name widely known ; and Mr. John Croil, of Aultsville, who has been a true and faithful director of our Association for many years ; also of one of the leading American horticulturists, Mr. P. Barry, of Rochester, president of the Western New York Horticultural Society. He has been long a member of our Association and has ever shown himself ready to give us the benefit of his extended knowledge of pomology.

Therefore, resolved that we, the members of the Fruit Growers' Association of Ontario, desire to record the high esteem in which these gentlemen have been held by us, the deep and unfeigned sorrow with which we received the sad news of their removal from our midst and the great disappointment with which we regard the loss which our favorite industry has thereby sustained.

THE WINTER MEETING.

The Winter Meeting was held in the Music Hall, Windsor, on Wednesday and Thursday, December 11th and 12th, 1889.

The President, A. M. Smith, Esq., took the chair at 2 p.m., and opened the meeting by a few remarks expressive of his pleasure at seeing such a large audience, and especially at seeing among them a number of friends from the American side, among whom he noticed with much satisfaction President Lyon, of the Michigan Horticultural Society.

THE ONTARIO FRUIT LIST.

There being no questions awaiting answers, the discussion of the Ontario Fruit List, presented by a Committee of the Association was proceeded with.*

Mr. BEALL (representing the Committee).—The Fruit List which is about to be discussed is a matter that has been under consideration to some extent for a number of years, but it is only of late that it has assumed a practical form. The Committee has been at a great deal of pains in getting at the matter, and have spent much time upon it, but up to the present they have only succeeded in classifying apples alone, so that the report this Committee proposes presenting may be looked upon as a report of progress rather than a full report. It is hardly to be expected that the list we are about to present will meet with the approval of everyone, as great differences of opinion exist in regard to the relative value of apples for different purposes, but those present will have an opportunity of making changes if desired. We have done away with many of the old style headings. We have only four, the first of which is the season, in regard to which there has been in the past great difference of opinion. The second heading is the quality of the apple, which is subdivided into dessert and cooking, which we believe will embody all that is necessary to be known respecting the quality of an apple. The other two headings are value for home market and value for foreign market. I do not think it is necessary for me to read over the whole list, but as it is arranged alphabetically I will take the first, the Alexander apple. You will understand that the numerical values, which range from 0 to 10, are under four heads, dessert, cooking, home market and foreign market. We consider the Alexander wholly worthless as a dessert apple, so that if it were exhibited with a lot of fruit for dessert purposes it would count 0. For cooking purposes we have rated it at 9. For the home market we call it 9. It is the business of this Association to endeavor to show which is the most profitable for

*For the Report see Appendix, pp. 82-6.

a man to grow. Now, here is one of the lowest, the Cornish Gilly-flower. The Gilly-flower for dessert purposes is rated 1. If it were put in as a dessert apple it would be worth more than the Alexander, but for cooking purposes it is worth 0, for the home market 1, and for the foreign market 2; so its total value is only 4. If we take the Northern Spy we give it 10 under each head; so it would be worth 40. You would need to have a great many apples on the table of the Cornish Gilly-flower's qualities to compete with one only of the Northern Spy.

KING OF TOMPKINS COUNTY.

Mr. WILKINSON.—How have you rated the King of Tompkins County?

Mr. BEALL.—The rating is under the four headings respectively, 8, 8, 10 and 10.

The SECRETARY.—I should be almost inclined to place that at 10 for cooking; it is one of the best.

Mr. WILKINSON.—I have always thought the King of Tompkins County one of the best that could be raised.

Mr. DEMPSEY.—Some feel like putting it at 10 for dessert. For my part I think 8 is high enough; when you compare the King of Tompkins with the Pomme Grise or Cox's Orange Pippin the King of Tompkins is very imperfect, and if you are going to give it 10 for cooking purposes I think it should be reduced in some other way, so that it will not count any more in the aggregate than it does now.

Mr. WILKINSON.—I think the King of Tompkins is rather inferior as a dessert apple.

The SECRETARY.—I move that the King of Tompkins be raised to 10 for cooking purposes.

The PRESIDENT.—It is moved and seconded that the King of Tompkins be raised to 10 for cooking purposes. Carried.

Mr. DEMPSEY.—I move that the King of Tompkins County be given 6 as a dessert apple. A perfect apple in every particular will only receive 40 points, and as it is left at present the King of Tompkins gets 38 points, and it is not worthy of it. We should reduce it as a dessert apple as much as we have raised it for cooking purposes.

The SECRETARY.—I agree with Mr. Dempsey: it is too high for a dessert apple at 8.

Mr. A. McD. ALLAN.—We considered in making this list what was the popular opinion, to some extent. We know that the King of Tompkins County in a strict ruling is not a dessert apple, but I have some doubt whether the time has yet come when we should fix the rating by the strictest rules. We have followed the popular sentiment to some extent, and hence we have given this apple a rating higher than we could in strictness.

Mr. ELLIOTT.—I raise a good many King of Tompkins, but I know most of my boys when they go down the cellar for an apple bring up a Northern Spy. Now, the Northern Spy is only good as a dessert apple for a certain season of the year, whereas the King of Tompkins is good as soon as it is ripe.

Prof. SAUNDERS.—I am enough of a boy myself to prefer the King of Tompkins to almost any other apple, and I hardly like to see it put as low as 6 for dessert purposes; I would rather take off somewhere else. I believe something should be taken off on account of its tendency to blow off the trees in stormy weather, but I do not like the idea of taking that much off it as a dessert apple because it would show unfairly when compared with other apples of perhaps inferior quality from your standpoint. I think the King of Tompkins County is one of the best apples that one can get to eat—one

of the highest flavors. I do not object to it on account of its size, for if I cannot eat the whole of one myself I have never any difficulty in finding some person who is quite willing to take a share in it.

The SECRETARY.—It seems to me that a good way of getting rid of this difficulty would be to have a column for productiveness, and in that way we would put the King of Tompkins down 3 or 4, and out of 50, which would be the maxim, it would have only 40 or 42.

SEVERAL MEMBERS.—That is a good suggestion.

Mr. WILKINSON.—I suppose the idea of this list is to guide those who wish to plant out an orchard, that they can refer to it and pick out those that have the highest value attached.

Mr. A. McD. ALLAN.—That is not the idea of this list ; there is a separate list for that. In this list we have the particulars that judges at exhibitions want. The difficulty in having a column for productiveness is this, that a great many of these apples are local, and while an apple might be very productive in one neighborhood under a certain set of circumstances, in another and under different conditions it might not be productive at all.

A MEMBER.—I do not think we need be afraid to let the King of Tompkins stand at 40.

Mr. RICE.—It has no rival ; I do not think there is any danger in letting it stand 10 all through.

Mr. DEMPSEY.—What is the object of our trying to produce new fruits if we have already arrived at perfection.

The PRESIDENT.—The question is before you ; shall we reduce the King of Tompkins County to 6 points as a dessert apple ? Lost.

THE NORTHERN SPY.

The PRESIDENT.—The Northern Spy is now before your consideration.

Mr. BEALL.—The Committee thought it better to put the Northern Spy at four 10s.

Prof. SAUNDERS.—I would move that it be not ranked higher than the King of Tompkins County.

The SECRETARY.—I second that ; it is inclined to spot sometimes in localities, and to be imperfect.

Mr. WILKINSON.—I think it is rated too high as a cooking apple ; it is very insipid.

Mr. WILSON (Chatham).—It is not a good enough keeper to rank as high as 10.

Mr. ALLAN.—There are several points you are forgetting. The list is constructed upon the understanding that we have perfect specimens ; and for the purpose of aiding judges when it is expected that perfect specimens are found on the exhibition table. In regard to a perfect Northern Spy, I am willing to stand by the rating given. I know that, even for the home market, the Northern Spy, for its own season, still stands at the top of the list, and in the foreign market it will do so every time. Of course we find many of them spotted, but that does not touch the question at all : we do not want these spotted apples, but perfect fruit in every instance.

The PRESIDENT.—The question is whether we shall reduce it, as has been moved and seconded. Lost.

The SECRETARY.—I am inclined to attack it on another point, that is for the foreign market. It is placed as high as the King, and certainly the King sells for higher price in the foreign market than the Northern Spy.

Mr. A. McD. ALLAN.—There, again, as far as the market is concerned, the standard is taken on the apple itself. You will make more out of the Northern Spy than the King ; its productiveness does it. You will make more out of a perfect crop of Northern Spies than out of a perfect crop of Kings. I think you will make more out of the Baldwin than the King, but it does not rank with the King.

Mr. ELLIOTT.—If a man who is a grandfather plants the Northern Spy in our part of the country his boys may get some of the fruit, but I have had some that have been planted thirteen years, and I have never got a crop yet.

Mr. RICE.—My friend here (Mr. Allan) says he can sell Baldwins quicker than the King. I had a hundred Baldwins in a fine location and I have not yet got a good crop.

The PRESIDENT.—This apple has been passed upon, let us take something else.

THE GREENING AND LOUISE.

A MEMBER.—Let us have the Greening.

Mr. BEALL.—We have rated that at 8 for dessert, 10 for cooking, 8 for home market and 8 for foreign market.

A MEMBER.—What about the Princess Louise?

Mr. BEALL.—We have it 8 for dessert, 7 for cooking, 7 for home market, 8 for foreign market.

The SECRETARY.—I do not think it is ranked high enough as a dessert apple, neither is it ranked highly enough as a market apple for the home market, for at Christmas time it takes on such a beautiful color that I think perfect samples should stand higher than the figure given. I think it should be 10 for dessert purposes.

Mr. A. McD. ALLAN.—The trouble is the Princess Louise is a new variety, not usually cultivated, and I have always gone on the principle of being very suspicious of anything new. I prefer to see it tested thoroughly first. I have a very high opinion of the Princess Louise, but upon that general principle I purposely rated it lower than I would otherwise have done on account of its newness, and its not being sufficiently tested.

The PRESIDENT.—As it is an apple not very generally known I think it is best to leave it alone.

THE GOLDEN RUSSET.

The PRESIDENT.—A member calls for the Golden Russet.

President LYON.—Which Golden Russet? Is it the English Golden Russet?

The MEMBER.—I mean the English Golden Russet. I claim there is an English and an American Golden Russet. The American is a deeper Russet and a larger apple, and never gets the beautiful yellow color the English variety gets.

Mr. DEMPSEY.—I think we know a little about Russet apples, and I may say I have never seen an American Russet yet. What is called the American Golden Russet was originated in England by Dr. Hogg, and he called it the Russett; there is some other name he had for it, which does not matter however. There are more than twenty varieties of the English Russet and twenty sizes.

President LYON.—There is no such thing as the English Golden Russet described. The Golden Russet of western New York is the English Golden Russet, but the book does not recognise it as entitled to the name English, though there is an American Golden Russet entirely distinct from it. The tree is an upright grower, and very unprofitable; here it is sometimes called the Sheepnose. It is quite distinct from the apple we have been talking about, and I think it is very desirable we should thoroughly understand these things and understand each other.

Mr. BEALL.—We may as well proceed to the question. Someone has asked the rating of the Golden Russet. The apple in question is the one that Downing simply calls the Golden Russet, but supposed to be of English origin; we have no authority from Downing that it actually is, but he says it is supposed to be. We have it down at 7 for dessert, 8 for cooking, 7 for home market and 9 for foreign market. [Rating not objected to.]

THE STARK.

Mr. BEALL.—I want to say there are three apples here that we have not on the list (referring to exhibit of apples). We have plenty of room, and shall be glad to put on any apple you may name, provided you give us the ratings here. Someone has mentioned the Stark; we will insert that if he will give us its proper rating.

Mr. WILSON.—I called for the Stark ; I found it here on the fruit table and I think it is remarkably good. It is spoken highly of by those who grow it, but beyond that I do not know anything about it.

Mr. CLIFFORD.—I have raised the Stark from nursery stock. The trees are bearing well, and it is fully as early as the Greening in this country, or the Baldwin, and a little larger than the latter apple. One man put out an orchard from my nursery a few years ago, and he told me this fall that the packers put up five and a half barrels from one tree, and the tree had been out eleven years. The apples are not first class quality, being a little thick in the skin, but they bear handling and shipping well. They are not as high colored as the Baldwin. The tree is very thrifty to grow in the nursery. I would not rate it as a first rate dessert apple, and it is hardly sharp enough to be a really good cooking apple. For its keeping qualities and prolificness I think it would rate high.

Mr. BEALL.—Can you give us any authority that this is the true name of the apple.

Mr. CLIFFORD.—Only that it is mentioned in all nurserymen's catalogues as the Stark. I think it was originated in central New York.

President LYON.—The Stark apple originated in Ohio. It will be found described in the list of the Ohio Pomological Society, in their report. It ranks quite low, except as to its keeping qualities for the market.

Mr. BEALL.—What would you consider is the proper season of the apple.

Mr. LYON.—It is a winter apple.

Mr. A. McD. ALLAN.—My recollection of the Stark is that it was particularly coarse—a heavy, coarse grained apple, and almost flavorless.

Mr. CLIFFORD.—What time did you test it.

Mr. ALLAN.—In the fall.

Mr. CLIFFORD.—About the 1st of April is the time it becomes eatable.

THE FAMEUSE.

The PRESIDENT.—The Snow apple is called for.

Mr. BEALL.—That is one of the disputed apples—its season is disputed. We have rated it as an autumn apple. For dessert we have marked it 8 with a good many qualms of conscience, for cooking 2, for home market 9, and for foreign market 8.

A MEMBER.—I think the rating for cooking is altogether too low ; it melts right down with a little sugar.

Mr. CASTON.—I agree with that ; I think there is only one better cooker than the Snow, and that is the Duchess.

Mr. WILSON.—I move that it be raised to 9 points as a dessert apple.

Mr. WILKINSON.—As a dessert apple I think it has no superior. As a cooker it is a little inferior, but for dessert purposes I think it is entitled to the maximum rating.

Mr. BEALL.—We do not recognize the name Snow at all ; we call it the Fameuse.

Mr. WILKINSON.—Of course I referred to the Fameuse though I said the Snow.

The PRESIDENT.—It is moved that the Fameuse be raised one point as a dessert apple. Carried.

Prof. SAUNDERS.—I move that it be raised five points as a cooking apple. Carried.

THE MANN AND SPITZENBERG.

A MEMBER.—Give us the rating of the Mann apple ?

Mr. BEALL.—4 for dessert, 7 for cooking, 7 for home market and 8 for foreign market. Approved.

A MEMBER.—The Spitzenberg ?

Mr. BEALL.—9 for dessert, 9 for cooking, 9 for home market and 10 for foreign market.

Mr. ELLIOTT.—For cooking I think it is rated too high, unless it is put in the oven early in the morning and cooked all day ; then we might give it 10.

Mr. WILKINSON.—I suggest raising it for dessert to 10.

Mr. A. McD. ALLAN.—I have no objection to agreeing with Mr. Wilkinson. As to its qualities as a dessert apple, it deserves to be hoisted up a point; it is certainly a magnificent dessert apple.

Prof. SAUNDERS.—I think it should stand where it is. It is a tough apple to eat; it is not a favorite with people who have not good teeth, and they have to be considered.

The PRESIDENT.—That is generally the fault of the grower or the person using it. When kept in a proper temperature it is all right; but it must not be kept in too dry a cellar or storage.

Mr. DEMPSEY.—The Spitzenberg has been largely grown in our section, but I think the last tree is now dead, and I for one am not sorry. I am surprised at any one suggesting that it be raised for dessert purposes.

The PRESIDENT.—Well, shall we raise it one point as a dessert apple? Lost.

SHIAWASSEE BEAUTY.

A MEMBER.—Let us hear the rating of the Shiawassee Beauty?

Mr. BEALL.—We have rated it 4 for dessert, 6 for cooking, 6 for home market and 9 for foreign market.

Prof. SAUNDERS.—I think that is too low for dessert. I move it be raised one point as a dessert apple. Carried.

The PRESIDENT.—We are asked for the rating of the Yellow Transparent.

Mr. BEALL.—For dessert 5, for cooking 7, for home market 4 and for foreign market 0.

Mr. MITCHELL (Leamington).—I have had it three or four seasons. It is a splendid bearer and as a dessert apple cannot be beaten; I would rank it higher than the Early Harvest. It does not spot, and is very even in size.

Mr. WILSON (Chatham).—People have been misled as to the time of its ripening. I find throughout the country that it does not ripen nearly so early as is represented, and it is not a very early apple at all.

Mr. MITCHELL (Leamington).—It will stay much longer on the tree than any other.

The SECRETARY.—How soon can you use it?

Mr. MITCHELL.—Much the same as the Early Harvest, perhaps a few days later, but it gets better in quality as it remains on the tree. So far as I am acquainted with it it is superior to the Summer Harvest. It does not spot, and it is very uniform in size.

The PRESIDENT.—It has been moved and seconded that this apple be raised to 6 for dessert purposes? Carried.

SALOME.

The PRESIDENT.—Can you give a rating for the Salome?

Mr. CASTON.—I think it is new in this Province.

President LYON.—In 1884, at the meeting of the Mississippi Valley Society at New Orleans, it was shown for the first time by a gentleman who originated it, or at least was introducing it in western Illinois. It was specially hardy and very promising for that reason, but only third or fourth rate in quality, and not particularly attractive either in appearance or size. It is a little below medium size. I do not think it has taken very strong hold upon the west. It does not reach into northern Iowa or Wisconsin at all, and I do not think that for Michigan or Ontario it would be well adapted.

Mr. WILSON.—I know it would not stand the northern climate at all.

GRIMES' GOLDEN.

The PRESIDENT.—The rating for Grimes' Golden is called for.

Mr. BEALL.—For dessert 9, for cooking 2, for home market 5, and for foreign market 7.

Prof. SAUNDERS.—I would like to see it raised a little for the home market as I think it is one of the finest apples for dessert. I move that it be raised at least one point for the home market, and I shall be very glad if anyone will tell me just now where I can get some.

Mr. A. McD. ALLAN.—I am willing to acquiesce in that, but it is difficult under other than exceptional circumstances to get a demand for it. There is no demand for it in the home or foreign market. I have tried it both here, in Britain and in the States. I got the best prices for it in New York, but it had been pretty well written up there at the time. I afterwards shipped some there and got very little for them.

Mr. DEMPSEY.—It is an apple that looks so much like a young seedling in every way that unless a person knows it he will not buy; but anyone who knows the apple will pay the highest price for it as a dessert apple. I think we have no better, but for the home market or foreign market it is certainly not sufficiently attractive to the eye.

Prof. SAUNDERS.—I think that is a reason why the committee should adopt my suggestion; it is our duty to show that we appreciate a really good apple, despite its ill looks.

Mr. BUCKE.—The reason it is so low is that its color is very much against it. You cannot tell Grimes' Golden in a barrel until it gets ripe, and gets its color.

President LYON.—It is one of those very rare varieties that grow down as far as Virginia, and yet it seems to hold its full quality with us, and even farther north than here.

Mr. ELLIOTT.—Here it colors up nicely on the tree—it does with me—a rich, golden yellow. I have shown it under two or three heads, and it has almost always taken a prize.

RED CANADA.

A MEMBER.—Give us the rating of Red Canada?

Mr. BEALL.—It is 2 for dessert, 6 for cooking, 7 for home market, and 8 for foreign market.

Mr. ELLIOTT.—It is superior to Ben Davis and I would recommend that it be raised to 6 for a dessert apple. Motion carried.

President LYON.—The Red Canada often passes for a Baldwin, but among buyers it is sometimes rated much higher as a dessert apple than as a culinary fruit. It is considerably sought after, and sold in the same market for much higher prices than the Baldwin, which is our next popular apple.

Mr. WIGLE (Kingsville).—We find it far ahead of the Baldwin.

Mr. WILSON.—I find the exporters are snapping at all the red apples they do not know the name of, and any apple they do not know the name of and which is red in color, they name "Canada Red." I do not think we can judge by the way it sells in the market whether it is a good apple or not.

BEN DAVIS.

A MEMBER.—What is the rating of Ben Davis?

Mr. BEALL.—3 for dessert, 1 for cooking, 8 for home market and 9 for foreign market.

The SECRETARY.—1 is enough for dessert, is it not?

Mr. WILSON.—I move that Ben Davis be rated 0 for dessert, 1 for cooking, and 9 for foreign market.

Mr. DEMPSEY.—Anything that is worth growing at all is worth growing well, and when we talk about the home market or the foreign market we mean, What is going to give us the most money? Now, I can make more money out of one tree of Ben Davis than I can off fifty trees of King of Tompkins County. We have a lot of trees of King of Tompkins County twelve years planted, and we have never realised twelve barrels off them, and we have got as much as twelve barrels off a single tree of Ben Davis. When we look at the quotations in the English market we find that Ben Davis is sold as high as 32 shillings per barrel.

Mr. ELLIOTT.—No doubt Ben Davis sells well, but I think a man who charges his neighbor two dollars for a barrel of them robs him of \$1.75. It is a good apple for hotel keepers ; a barrel of Ben Davis will last a first class hotel as a dessert apple about three months, whereas a really good variety would not last a week. If you send a boy into the cellar to get an apple to eat he never brings up a Ben Davis, and if your wife goes down for the purpose of putting you in a good humor by making an apple dumpling she does not take Ben Davis.

Mr. A. McD. ALLAN.—I quite agree with all that has been said. Although good prices are now paid in England for Ben Davis, the consumers in England when better acquainted with it will not pay the prices that have been realised for it ; it is going to come down in value, and that, too, before very long. The fact of the matter is that they are seeing into the qualities of apples quicker in that market than are the consumers in our own markets. The Baldwin, for instance, is coming down, and at the same time the Rhode Island Greening is coming up to its proper place. Ben Davis is bound to go down.

A MEMBER.—I think it should be lowered for the home market. We cast a reflection upon the judgment of the consumers when we say this apple is worth only 1 for dessert, 1 for cooking, and yet that it is worth 8 for the home market, the consumers of this country. I think you must lower it for the home market.

Mr. ALLAN.—Why should we, as long as the consumers are willing to pay the price ?

Mr. CASTON (Craighurst).—I think it ought to go up a point for cooking ; in our section it is not as bad as some people here make it out to be.

The SECRETARY.—Do you flavor it with lemons ? (Laughter).

Mr. CASTON.—No, nothing but sugar.

No change made for home market ; motion carried.

BEST SELECTION OF APPLES FOR THE COUNTY OF ESSEX.

The President announced that Mr. ALANSON ELLIOTT, President of the South Essex Farmers' Institut, would read a paper on the subject of the best selection of apples for the county of Essex—three summer, three fall, and six winter varieties.

Mr. ELLIOTT.—There seems to be some misunderstanding ; I have no paper to read on this subject, though in a meeting of this description I do like to do a little skirmishing. You are now, gentlemen, in one of the most wonderful counties of the Dominion, and anything that would not suit us here would surely not suit people in distant parts. I would not form any judgment as to the three best summer apples, because I do not think we have any good summer apple at all. Take the Early Harvest, for instance. It used to be a good apple, but it is now a failure ; it is very rarely you see a good specimen of the Early Harvest nowadays. Then as to the Red Astrachan ; I have never bought any of them myself, but judging by what I hear from those who have had experience with it, it is not valuable. As to the Duchess of Oldenburg, I take no stock in it. We have never had a market for summer apples. I do not know anything of the Gravenstein or Benoni ; in fact I do not know anything about summer or fall apples.

The PRESIDENT.—What about winter apples ?

Mr. ELLIOTT.—I know the Baldwin is a good apple after our trees come into bearing, and we can better afford to raise the Baldwin for a dollar a barrel than we can the King for two dollars a barrel. Then I put the Greening as another.

The PRESIDENT.—What is the third ?

Mr. ELLIOTT.—Well, I left home with the impression that I liked the Mann apple.

The PRESIDENT.—Would you put that as one of the six best ?

Mr. ELLIOTT.—Yes, if you make it six I will. Then I think a good deal of the Stark ; I think it is the coming apple. I would put that as one of the six. I cannot speak from experience of the Spy, neither would I advise anyone to raise the King ; there is not much money in it, it is not a good yielder, but the great trouble with it is that the apples fall. The Canada Red is a good apple and a good yielder, and I put it as one of my six. There is another apple that I have not heard mentioned here to-day,

Peck's Pleasant, which is a good bearer and a good apple. I think there is more money in Baldwins and Greenings than in any other apples we raise. We have a dozen different kinds of Russets; but I would not advise anyone here to grow Russets, as they become deformed. The Spitzenberg used to be a good apple some years ago, but this fall a gentleman asked me to get him a barrel, and I could not get a barrel of good ones in the whole county of Essex. The Talman Sweet is a good apple; it is not an extra fine dessert apple, but I never saw its equal as a baking apple. The Northern Spy is a good apple, but I think it is less suited to our light soil than to a heavier land. I am a great admirer of the Fall Pippin, but there is not much money made in growing it. Seek-no-further bears very well with us. St. Lawrence is a good apple when it is ripe, but you want to get there the night before or it will be rotten next morning. The Ribston Pippin, though a good apple, is not an extra bearer with us, and the Fall Pippin is a shy bearer. The Duchess is I think a kind of first cousin to the St. Lawrence. It is a good cooking apple before it gets ripe. Another very good fall apple, that will stand shipping, is the Sherwood; it is a long striped apple, and is an extra apple to yield with us. Then there is the Maiden's Blush, we get about as perfect apples off it as from any tree that grows.

THE QUESTION DRAWER.

The following questions were discussed from the Question Drawer:

SHOULD EXHIBITORS OF FRUIT BE THE OWNERS OF IT?

Q.—Should fruit exhibited be the *bona fide* property of the exhibitor?

The PRESIDENT.—I do not think anyone here will say otherwise.

President LYON.—We have for several years in Michigan given premiums for collections of fruit which may be gathered within a certain district, not exacting rigidly that they shall be of the exhibitor's own growth, but it is only in the case of those collections that exhibitors are allowed to cull from others. I think this plan has added greatly to the interest of the exhibition, because it shows the capabilities of the district from within which the fruit is drawn.

The PRESIDENT.—Are your people in Michigan all perfectly honest? We have a similar plan here in some of our fairs, and I have heard it more than hinted that when these people are making their collections of fruit they, at the same time, get a little to be exhibited as of their own growth.

President LYON.—We endeavor to draw the line very rigidly, and if any complaint is made it is always examined closely by the proper authorities.

The PRESIDENT.—I have heard it said that the man who won the medal at the last Toronto Exhibition collected almost all his exhibit, and raised only a very small proportion. I know that it is done in local fairs right along, and I think it is a very unfair thing and one with which this Society ought to deal if possible.

Mr. WILKINSON.—I have been connected with fairs in this district for thirty or forty years, and have filled almost every office, and I do not think it is fair to allow any but *bona fide* producer. There have actually been cases where a *bona fide* exhibitor has been beaten by fruit of his own growth exhibited by some one who has collected fruit to show. The only excuse is that a finer display may be made by getting together a fine collection.

The SECRETARY.—The only thing that can be done to remedy it that I can see is to pass a resolution in this way, that in the opinion of this Association every exhibitor of fruits at any fairs should be required to sign a written certificate that the fruit he exhibits is of his own growth, and that there should be some forfeit in case it is shown that such exhibit is not as represented.

Mr. WILKINSON.—That he should forfeit all prizes, and be debarred from again exhibiting for two years.

Mr. DEMPSEY.—I think the best and only way to meet that difficulty, which is a very serious one, is for all honest exhibitors to keep their fruit at home. I gave notice to a couple of our Associations this year that, though I won prizes liberally, I would not take the trouble to pick my fruit and place it on exhibition against persons whom I know did not grow the fruit shown by them.

Mr. MORTON (Wingham).—Our rule is that fruit shall be the property of the exhibitor, grown upon his farm or holding; and I think we have a rule that any exhibitor may be required to make a statutory declaration to that effect. Of course if a man comes along and makes a false declaration we cannot stop him, though he would, of course, make himself liable to the penalty for perjury. I think we have only had occasion to demand that declaration two or three times. Twice we stopped the man, and in the third case the declaration was taken, and I do not doubt the man's claim was *bona fide*, and that our suspicions were unfounded.

Mr. WILKINSON.—I quite agree with that; our rules are somewhat similar.

The SECRETARY.—Mr. President, I have a motion to make with reference to this matter. It appears to me that it would be better that all exhibitors should sign a declaration or certificate, because if you only ask one whom you suspect, you feel rather delicate about it, it being as much as to say that you suspect him of being dishonest. But if you require all to sign such a declaration it becomes a matter of course, and I think if the rule were generally known that very few exhibitors would seek to evade it. I, therefore, move this resolution, which is seconded by Professor Saunders:

That in the opinion of this Association exhibitors of fruit at fairs should be required to sign a certificate that the fruit shown is of their own growth, and that in case of any trickery being proved, forfeiture of prizes is to follow.

Mr. MORTON.—The difficulty is that you cannot make a certificate of that kind that will hold water, because, if he makes a false declaration, it is only punishable if false with regard to the facts, and the declaration must be made after the exhibit is made.

Professor SAUNDERS.—I think in the usual form of certificate the exhibitor declares that the article shown is of his own production, growth or manufacture, and it seems to me that it is not sufficiently definite for fruit exhibitors. I think the certificate for fruit exhibitors should be so worded that there would be no evading it. Let the forfeiture be clearly shown that would follow any infraction of the rule, and I think it would have some effect. People get behind that general certificate and say they did not understand it. It should be made so clear that there can be no misunderstanding it, and if the directors then do their duty and withhold the prizes in any case where complaint is made or suspicion exists, until full inquiry is made and sufficient evidence brought forward, I think it would help very much in regulating the matter.

Mr. A. McD. ALLAN.—I have often judged fruit at fairs when I knew that the fruit of certain exhibitors was not of their own growth, but then I had nothing to do with that. As has been said here, one thing that is to a great extent responsible for this trouble is the practice of offering prizes for large collections. It does not pay any one grower to grow thirty or forty varieties, and I think ten or a dozen would be quite sufficient for almost any section where apples are grown. Where it is desired to have large collections shown at fairs, I think they should be collected by the Society, but I would not allow any individual to exhibit them or receive a prize for such a collection. The fact of the matter is that the offer of such a prize is a strong inducement for some man to go and steal the fruit.

Mr. BUCKE.—This may be all very well at local fairs, but how can you find out who grew the fruit at Toronto Exhibition, or some of the other larger exhibitions? You cannot follow it up—it is impossible.

Mr. CASTON.—I think any man who is perfectly honest in making his exhibit need not be backward in making the required affidavit, and will not object to it at all. There is one difficulty in regard to fairs at which it is a rule, if you suspect a man of not being honest in his exhibit that you must protest, depositing a dollar at the time of making the protest. Then, if you fail to prove the allegation you forfeit the dollar. It is not exactly the loss of the dollar, but you get into bad odor if you make a complaint which

turns out to be unfounded, though there may have been suspicious circumstances justifying the protest. I have known very bad feeling to be engendered in some cases of this kind. Now, if everyone was required to make the affidavit, it would get over that difficulty better than anything else, I think.

Mr. ELLIOTT.—None of these certificates or declarations will do any good unless the persons who are aware that crooked practices are going on will make that fact known, and they will not do it. At a fair at which I was a judge recently a man said to me, "I want to see which of the Ben Davis' got the prize." I showed him the one, and he said, "Why, he (meaning the exhibitor) got that out of my orchard." Now, if men like that would tell the secretary and put in a protest, that kind o' thing would soon disappear. If people will stand by silently and see prizes carried off by fruit which they know well the exhibitor has never grown, all the declarations and affidavits will not do any good.

The SECRETARY.—I think we could have a printed form of affidavit to be taken by every exhibitor, as Mr. Caston says, and, in case of any trickery being shown, forfeiture of the prizes won at the exhibition should follow.

The motion was then put and carried.

ADDRESSES AT THE EVENING SESSION.

At the opening of the evening session the President announced that there were a number of local gentlemen, and gentlemen from the American side in the hall, upon whom he would call for short addresses. He then called upon the Mayor of Windsor.

WELCOME TO WINDSOR.

Mayor TWOMEY, who was received with applause, expressed the great satisfaction he felt in seeing the officers and so many members of the Association in the town of Windsor, and he was also much gratified by the presence of the gentlemen from Michigan. To all of them, on behalf of the citizens of Windsor, he had much pleasure in extending a most hearty welcome to that town and the county of Essex, where the importance of the aims and work of the Fruit Growers' Association were well known and appreciated. He had always regarded the county of Essex as the garden of the Dominion, and he felt sure the chairman knew well the many advantages that county enjoyed as a centre of fruit cultivation. Still, he believed the fruit industry was but in its infancy at present, and had no doubt that a great stimulus would be imparted to it by the visit of the Association, which he hoped to see repeated at no very distant date.

The President replied fittingly to the Mayor's remarks, and then called upon President Lyon, of the Michigan Horticultural Society, for a few remarks.

FRUIT GROWING IN MICHIGAN.

Mr. LYON said, speaking for the Michigan Horticultural Society, that they were trying to do their part in elevating horticultural and pomological interests in the State of Michigan. Pomology was occupying the attention of a great many in that state, in the eastern part more especially, while in western Michigan peach growing was becoming a leading industry. Their society had existed since 1870, and they felt that its existence had been the cause of improvement and advancement in fruit culture generally, and that they had been instrumental in bringing order out of confusion. He then described the manner in which it had become necessary to have local societies to ascertain the fruits suitable to be grown within limited districts, instead of having a general list of American fruits, some of which, though grown successfully in one part, were quite unsuitable for others. This dividing up into smaller districts had been going on since 1848, when an

assembly of fruit growers had met in Buffalo to prepare a fruit list for the United States. Although this was a Canadian Association, he felt that the members of all Fruit Growers' Associations were brothers in a great and good work, and he hoped they would always work together harmoniously for the promotion of the common weal.

Mr. TAYLOR, of Michigan, was then called upon by the President. He said that the predominating interest among the fruit growers of western Michigan at the present time was peach culture, though grapes, pears and small fruit were grown to some extent. The district from which he came was about six miles wide and forty miles long. In every part of the state, where the prospect seemed at all hopeful, peach orchards were being planted, but, in the district he had referred to, peach culture was almost the staple occupation, the peach orchards being almost continuous from farm to farm for long stretches. When the trees were in bloom the sight was a most beautiful and inspiring one. The crop during the summer of 1889 had been the smallest they had had since 1875, but some years the crop was larger than they had railway facilities for getting to a market in time to realise upon them. At the nearest lake port to this district, where steamers for Chicago and Milwaukee called, it had been the regular thing a year ago to load three boats each evening for those markets, each boat carrying from five to fifteen thousand baskets. Two miles south two other vessels were loaded, and ten miles east ten or fifteen cars per day. On one day, when the wind was so boisterous as to prevent the boats sailing, he had driven to the railway at 4 o'clock in the afternoon, and before reaching it he found teams strung out for half a mile on the highway, waiting their turn to load fruit on the cars. These facts would give some idea of the quantity of fruit grown in that district. Their earliest peaches ripened about the middle of July, and shipments began about that time, increasing until about the middle of August, when shipments became very heavy, and continuing so until about the 15th of October. The speaker concluded his remarks by expressing his pleasure at meeting with his Canadian brethren, and his conviction that by united efforts much would be accomplished for fruit culture both here and in his own country.

VINE CULTURE AND WINE MAKING IN ESSEX.

After the audience had been favored with a piano solo by Miss Werrett, the President called upon Mr. Solomon White, of Windsor.

Mr. WIRRN said he desired to endorse everything that had been said by the worthy Mayor of Windsor in welcoming the members of the Association to the town of Windsor and county of Essex; he only regretted that their visit had not been made at a time when they could have had ocular demonstration by a visit to some of their orchards, full of trees loaded down with delicious fruit, of the capacity of Essex as a fruit producing county. He himself had done something in fruit growing, principally in vine culture and wine making, and he might say that he had to-day in his cellar wines made almost twenty years ago, and yet sound and good. The great secret of making wine that would keep was to bring the fruit to what would be called its normal condition. The grapes grown in the county of Essex were to a large extent normal; but where he had had experience elsewhere, near Toronto, they were not, and required the addition of a little sugar and water to bring them to that condition. These were facts he had learned long ago, and since then he had succeeded pretty well. Some ministers were very anxious for a non-fermented wine, but he really did not know where they would find it, for it must ferment until the alcohol was all converted and all foreign matter thrown out and done away with. When the normal condition of which he had spoken of was reached, the wine, if strong enough, would keep. Vine culture and wine making was a great industry in the county, and though the number engaged in it was constantly increasing, the demand was greater than they were able to meet. He would recommend them to go and see his old friend Major Wagstaff, who had some as fine wine in his cellar as could be found, and who could show them what was to be made in the county. Coming to apples, he claimed for the county of Essex that in it could be raised the finest apples to be found anywhere, and especially along the lake shore. He felt great pleasure in

being present at these meetings, where so much could be learned useful to the fruit grower, and he trusted the present visit of the Association to the town of Windsor would not be its last, but that they might on some future occasion return at a time when they could be shown to more advantage the beauties of the county.

HORTICULTURE IN THE PUBLIC SCHOOLS.

Mr. C. W. GARFIELD, of Grand Rapids, Michigan, was then called upon, and after making a few remarks on the similarity of fruit growing conditions in Michigan and western Ontario, and of the feeling of brotherly love which should exist between the Michigan horticulturists and those of Ontario, expressed his desire to say a few words on the subject of horticulture in the public schools, for if he felt more earnestly on any one subject than another it was upon the question how the younger portion of the community should be instructed and encouraged in horticulture. The only way he could see of doing this was by enlisting the sympathies of the teachers. It was not often that children could be got together in such a meeting as the present one, but it was possible to form little coteries in which a number of neighbors, their wives and children, might get together and discuss such questions, and thus instil an interest in the subject into them. They wanted to bring to this some of the enthusiasm which carried them along in their horticultural life. He felt great pleasure in joining in discussions on horticultural subjects, not only those connected with the question of how much money could be got out of it, but those which related to horticulture in its highest and best form.

Mr. A. MCNEILL, science master of the Windsor high school, followed. He said he was heartily in accord with the previous speaker, who had said very truly that it was not possible for a public school teacher who himself knew nothing of horticulture to impart an interest in it to the children under his charge. He had been a senior teacher for some years, and he was sorry to say that he knew very few of his fellow teachers who were at all interested in that line. In his own botany classes he had found no difficulty in getting up an interest in the subject; he found that he could interest his pupils from one end of the session to the other; the interest they showed was really surprising. He referred to the difficulty of getting young people now-a-days to stick to the farm, and said he had no doubt that as soon as intelligence could be brought to bear upon farm life there would be no more difficulty in that respect; the young people showed to other callings because more intelligence was apparently called for in them, and so, when by the application of intelligence agricultural and horticultural pursuits assumed their proper dignity, young people would flock to them, instead of deserting them for other occupations.

After a duet by Messrs. Pepper and McLaughlin had been sung, Mr. Edwin Reid, Secretary of the Michigan Horticultural Society, was called upon.

Mr. REID, while acknowledging the honor of being asked to address the meeting, said he did not think it necessary for him to add anything to what had been said by his fellow-countrymen, President Lyon and Mr. Garfield.

PROF. SAUNDERS ON HORTICULTURE.

The PRESIDENT then called upon Prof. Saunders, of the Dominion Experimental Farm, Ottawa.

Prof. SAUNDERS.—I am highly delighted this evening to meet with our friends from the other side, and I am sure their visit will do both them and us good. I have had personal experience of the very hospitable manner in which they are in the habit of treating Canadians, and I trust they will carry away as favorable impressions of us as I and others, who have been fortunate enough to spend a short time among them, did of their kindness. I must next congratulate the people of this district and the county of Essex on the splendid country they possess, of which I believe the half has not yet been told. About fifteen years ago, when a director of the Fruit Growers' Association, I with

three others was deputed to inspect and report upon the character of the lake shore district from St. Thomas to Amherstburg. We started out with the expectation that we would be able to complete the task in two or three days, and we had vehicles to take us along, but we found so much to interest us that our time was consumed before we reached Chatham. We found so many evidences of the advantages of the district for the growth not only of apples, pears and plums, but also of peaches, that the committee were quite astonished and reported most favorably of the district, hoping the next year to take up the remainder of the district, including this, your favorite county. I believe, however, that this was not done, and the work has never been completed. I make the suggestion, and think it would not be a bad idea, for the Association to send a deputation up here, to report upon the advantages possessed by this district for the growth of the finer fruits. I am sure they can be produced here in great abundance. In connection with my duties as director of the Experimental Farm, it is my business to travel from Halifax to Vancouver, and I try to find out all I can about that little stretch of country—only about four thousand miles! But it takes some time to get over it and get acquainted with it and the differences of climate, soil and other characteristics connected with it. I have seen and examined the most favored districts of British Columbia, and some of them are certainly very promising for fruit growing; but I am free to say that I am not acquainted with any part of the Dominion in which fruit-growing can be carried on with greater promise of success than in the county of Essex. The display we have upon the table before us, most of which, I understand, comes from this vicinity, and has been produced here, should be sufficient to satisfy anyone that it is indeed a great fruit district which can grow such apples as these, keeping until this time in such condition as we see them. I would advise you, one and all, to cultivate more fruit; and I may say here that I believe in the aesthetic aspect of the question which has been advanced by my friend Mr. Garfield. You will seldom find a man actively and enthusiastically engaged in any department of horticulture who is a bad man. I suppose I ought to say something to you about the present and future of experimental farm work, as it bears upon fruit culture in Canada. In the organization of the work of the Experimental Farm, as the name implies, all departments of agriculture are expected to be covered; everything, in fact, with which a farmer is concerned—corn growing, stock raising and all the other important features of farm work. Such experimental work, taken up from time to time, will be most beneficial to the provinces in which these farms are situated. That is all I propose saying about the farm work generally. But in the department of horticulture I must say a few words more, as there are many very important aspects of this work to be considered, when we take into account the population of the Dominion and its needs. I firmly believe that it is the best policy and the only practical solution of some existing difficulties, that in districts like this, which are very favorably situated for fruit growing, it should be gone into on a large scale. I am equally as strong in my belief of the importance of having fruit at every man's door if it is possible to have it, in every part of this Dominion, but while there are few sections of the country where small fruits, such as strawberries, raspberries, gooseberries and currants cannot be grown, there are very many indeed where a beautiful apple, pear, plum, or peach, such as you can grow in Essex, cannot be grown at all; where the trees will not endure the severity of the climate. Either the cold of winter or the drouth of summer is sure to destroy them. The work of the Experimental Farm is to introduce from other countries having similar climates, and to originate in our own country varieties specially adapted to those districts not so favorably situated as yours is, so that we may eventually be able to produce apples, pears and plums which will prove hardy even in the most rigorous climates. We have in the Dominion to furnish to the settler the varieties he can grow to advantage, and if they are not up to the first quality, I know they will appreciate in the districts I have spoken of even second and third class, if they can grow them. In connection with the Experimental Farm work, a farm has been selected in Nova Scotia, at a village called Napan, where, though there are good facilities for fruit growing, the people have not paid much attention to it; partly, as they will tell you if you ask them, that they can buy apples grown in the famous Annapolis Valley cheaper than they can grow them. They are beginning, however, to realise that

it is better to grow fruit themselves, and orchards are being planted by them now, owing, more or less, to the advice and example given them by us, which served as an interesting object lesson to them. I have no doubt that fruit growing will become very general there within the next ten or twelve years. In the North-west one farm is located in one of the great wheat belts of Manitoba, and the other on the verge of the prairie district in the territory, where the climate is a continuation of the great American desert, and the rainfall is lacking which they get further east, in Manitoba. In those districts we are endeavoring to test such varieties as can be obtained in Russia, Silesia and different other European countries—the apples, pears and plums that are found to grow in similar districts there. We are also trying to get from our neighbors in Minnesota such fruits as they have adapted to the North-west. I have no doubt that in a few years we shall be able to establish a degree of reciprocity with them in that line, whether a reciprocity treaty be negotiated or not. I made an attempt in that direction recently, when in Washington, and succeeded so well that the Secretary there has placed us on the list of Experimental Stations which receive samples of the seeds and products the United States receives from abroad, and we shall send them any we may introduce as soon as we possibly can. I think this reciprocal interchange among our fruit growers and those of the United States will do good, and our neighbors across the line are so good-natured that it is pleasant to get among them to negotiate with them these little trifles of bargains. Of course we generally try to get a little the better of them; it would not do for us to lose the reputation we have gained in that respect. The United States have done a great deal in this direction, in the introduction of new trees from Russia for testing in the colder climates of this continent, and none of them so much as Iowa. Professor Budd has been associated with our own Mr. Gibb, of Abbotsford, P.Q. They travelled together through Russia, and secured and introduced into this country many new varieties of fruits, giving promise of being adapted to the requirements and climate of the country. A few weeks ago, while at Indian Head, I went very carefully over the Russian apples sent up a year ago last spring, which have stood two summers and one winter, and I must say the success attending their growth was very gratifying, although the season has been unusually trying, the rainfall being little more than five inches between April and September, and the trees manifested a degree of hardihood and vigor that I think augurs well for the future. Not only apples, but some cherries also, promised very well; and through the energy of our excellent secretary, we are now on the eve of getting from another part of Russia a consignment of trees of a very promising sort, which I trust will prove another very valuable addition to the list we are trying to grow at the present time. Apart from these introductions we are trying to originate new fruit. I will give you one experiment now in progress, from which you will have an idea of the work we are trying to do in this respect. The town of Riga, in Russia, is, I suppose, about a thousand miles north of the latitude of Winnipeg, and around that district a great many varieties of fruit are grown, and even north of that in Russia, where the climate is very cold, and they have dry winds something like those in our own prairie district. Through the kindness of a seedsman in that town I have been able to secure a considerable quantity of seed of apples, pears and cherries which have been ripened and sold in the markets in towns north of that place. From these seeds—I think I am within the mark—fifteen hundred trees have been grown; seedling trees, which will be planted out in orchards in Ottawa and at the North-west farm, and it is expected that by thus multiplying the chances of success almost *ad libitum*, we shall, in a very short time, get some varieties to manifest that degree of hardiness to make them meet the great want of our people all over the country. In addition to growing seedlings in the way I have outlined, we are endeavoring, by cross-fertilization with the hardiest fruits we have, to produce new varieties. You must not think all our labors are devoted to the interests of the North-west, or the colder sections of the country however. We are endeavoring to help the dwellers in such situations as yours in Essex, and other favored parts of the country, by introducing and testing new varieties as they come out. We hope by testing these new varieties, some of which are so highly lauded and little deserving of it, to be able to save many a farmer a very large expenditure, to which he has been hitherto subject, in having to test these things for himself. The

new varieties will be tested once for all in an authoritative manner, and their value determined in such a way as to inspire confidence among the fruit growers of this country. And a great saving of both time and money may be thus effected, while actually useful varieties will be placed before the fruit growers in a way which could not be done under any other system. I am very glad to be present with you here, and to have had an opportunity of making these few remarks, with which I hope I have not occupied too much of your time.

ESSEX AS A FRUIT-GROWING COUNTY.

After the audience had been favored by a solo given by Mr. Patterson, of Windsor, the Chairman called upon Mr. Cleary, of Windsor.

Mr. CLEARY expressed his thanks for the compliment paid him in being asked to speak at the meeting, and said it afforded him great satisfaction that the meeting of the Fruit Growers' Association should have been held in Essex, as he felt it would be of great benefit to the county, by drawing attention to its advantages as a fruit-growing and agricultural section of the Dominion. It was situated, he said, very similarly to the State of Michigan, and the climate was most favorable for the cultivation of fruit. The county was situated in about the same latitude as Spain, and it would perhaps surprise some of his hearers to learn that in it could be grown fruit which could not be grown elsewhere in Canada. He had seen Catawba grapes growing on Pelee Island on the 15th of October, and in some parts of the county sweet potatoes could be grown. If this meeting of the fruit growers resulted in drawing attention to the county, it would be productive of much benefit, for although the area of the county of Essex was about 430,000 acres, only about one-third of it was cleared and in cultivation, and of that area about one-quarter was devoted to the cultivation of corn, which, in Essex and Kent, could be grown with as much success as in the Western States. He was happy to be able to bear testimony to the truth of what Mr. Solomon White had said regarding the wine in his cellar. Longfellow had said of Catawba wine:

For richest and best
Is the wine of the West
That grows by the beautiful River,
Whose sweet perfume
Fills all the room
With a benison on the giver.

EVAPORATED FRUIT—GROWTH AND IMPORTANCE OF THE INDUSTRY.

Mr. L. B. RICE, of Port Huron, Mich., read the following paper on this subject:

In presenting the subject in question to this society to-night, I would refer briefly to the history, growth and importance of this enterprise, for, like all other great enterprises, it has had its small beginning and its infant days. It is true that the ancient inhabitants of the desert regions of Asia and Africa dried and pressed the farinaceous fruits of the date, palm and the prune, and that these formed largely the food used on their long journeys across the arid sands. But I have not gone back to their means of drying and pressing the fruit; nor have I traced the method by which the aborigines of this country prepared their berries, so that they would keep even when buried under the ground. I have commenced with my personal recollections of fruit evaporating in my own home. My recollections commence in the typical log house of western New York, with its broad fireplace and stick chimney, situated on the old Ridge road in the town of Sodus. Every evening during the autumn, father, mother, brothers and the hired help gathered in a wide circle around the great fireplace, to pare apples or peaches for drying, with which to assist in buying our winter's clothing. The apples were pared by hand, cut into quarters and the core cut out in the most artistic style. The quarters were then

put on strings. Some of the neighbors bought wrapping twine from the store, but my mother would take the tow that was left when she spun her flax for our summer clothing, re-card it and spin it into nice strong twine for that purpose. I remember well that a great wooden bowl was placed on the table and the quarters thrown into it as they were prepared. Around this bowl two or three of us were gathered, with our needles and strings, to string the apples. These strings of apples were hung on racks on either side of the fireplace and on the edge of the mantel-shelf; they were also suspended from the chamber floor joist on the sunny side of the house outdoors, and in every place where they could be dried. The first improvement came in using scaffold boards to spread them on. We got out some logs in the winter and took them to the saw-mill, had them cut on shenes, and used the boards to build and cover the scaffolding. Everything was extemporized for use—even the more flat roofs of houses, sheds, barns, etc.—wherever the fruit could get the sun. But if there should come on a few days of wet weather, there was trouble and loss. We had to go back to the use of strings. Racks were made of strips of lath and put over the stove, under it and all around. From this the transition was easy to a small room set apart for the purpose. A stove was placed in it and racks covered with apples placed above, below and on all sides. But there was the danger of having a hot fire maintained in the house, and several buildings were burned. To avoid this trouble a small house was put up away from the farm buildings, and a stove placed in it, and it was christened a "dry-house."

While all of these improvements were being made in the art of drying the fruit the spirit of invention was advancing in other lines as well. Some ingenious person conceived the idea of paring the apples with a machine. We could not see how it could be done, but he accomplished the task. It was in this manner: A fork with two prongs was forged in one end of a small rod of iron, and the other end was bent into a crank. Two upright standards were placed at one end of a board $2\frac{1}{2}$ to 3 feet long, and this was fastened to the top of them by means of staples driven in, thus forming the bearings on which it was to turn. To use this machine the operator would place the free end of the board on a chair or bench, then, sitting on it, he would turn the crank with his right hand, holding the knife in his left. The knife was made of a thin piece of steel, bent at the ends and driven into a piece of wood, being raised just enough to represent the thickness of the paring. With this a good, spry young man could pare a bushel of good-sized smooth apples in an hour. These were the glorious days of "paring bees." The lucky young man who owned one of these machines was sure of an invitation to all of the bees in the neighborhood; more than that, he was sure of two of the smartest girls to slice his apples, and a big piece of pumpkin pie at 10 o'clock, and in some instances, a half hour's frolic. But the restless Yankee spirit could not stop at this. His inventive genius, so thoroughly aroused, and starting out under such favorable auspices in the great fruit belt of western New York, has never slumbered. There soon appeared a paring machine with large and small wooden wheels and a belt, so that increased speed could be given to the motion of the apple, and this was followed by the first cast iron geared machines.

Some time in 1857, I think it was, one Mr. Mason brought out a little portable dry house. I say "dry house," for we had not yet risen to the dignity of the name "evaporator." Mason's dry house met the wants of the small producer better than anything else ever given to the public, and thousands of them are still in use, giving good satisfaction. The building was 4 feet 6 inches by 7 feet on the ground and 7 feet high to the eaves. The heater was a sheet iron cylinder about 6 feet long, with cast iron heads, in one of which was a door and draft, while the other was solid. The door was flush with one end of the building, so that the wood was put in from the outside. The stovepipe came out on each side near the back end, and returned to the front, where it was joined into one and came out just above the door. This accommodated 10 or 12 trays, 3 feet by 4 feet, and would dry as many bushels in a day. Its capacity is increased by building larger and increasing the diameter and length of the cylinder heater. All of the principles of the tower and hot air draft were and are used in this, as it depends for success on free admittance of air at the bottom, and good ventilation at the top. The patent has expired long ago, and any person can use it freely. With wooden slats for trays, the

cost complete is about \$20. While speaking of small evaporators, there is another very much in favor among the next class of produces. It consists of two brick walls about 3 feet 6 inches or 4 feet apart, and sheet iron so placed in as to carry the draft backwards and forwards from one end to the other, and trays put in between. A \$75 Canton furnace is used, the whole costing about \$200 aside from the building, which is large enough to have the work done in it.

The first to build on a large scale was Alden. He used a tower 4 feet square on the inside, and running from the basement through and out of the top of a two story house. Steam radiators were used, being placed at the bottom of the tower; but these failed to give satisfaction, and were replaced by hot air furnaces. The apples were put on 30 to 40 trays, one above the other, the fresh being introduced at the top and gradually lowered to the floor of the first story, where the dry ones were taken out. This seemed to be the most philosophical method, but it was found that the fruit was scorched when brought near to the fire, and the process was reversed. The green fruit was put in nearest the furnace and gradually raised, the dry ones being taken out at the top. As often as a new one was introduced the others were raised. This was a great convenience, as the first story could be used as a workshop, the apples going directly into the tower, while the upper floor was used to store the dried fruit. This style of evaporator has come out with a great many variations, and with as many different inventions for hoisting the trays during the process of drying. Alden raised his trays with four endless chains. Williams used two towers, with a device so that the trays were lowered in one and passed up through the other, being taken out and put in at the same place. Now most of them build a tower of brick like a great chimney, 4 feet square on the inside, with a furnace in the bottom and a draft-hood on the top, above the building. These are practically fire-proof. Alden tried to sustain a claim against all others for infringement, on the ground that his patent covered the use of hot air currents to carry off the moisture, no matter in what form it is used. The evaporating people combined to contest the claim, and the struggle lasted several years. Proof was obtained that hot air currents for drying purposes had been in use in various parts of the country for years. The process was described by writers, notable among whom was Patrick Barry, the venerable president of the Western New York Horticultural Society.

In the first evaporators wood was used for trays, then common iron wire, but the wire had to be renewed every few years, as it would get rusty however well cared for. Then came galvanized wire, as at present used, of which I will speak further on.

Horizontal evaporators have been in use with natural or forced currents of heated air. They were brought into favor during the war of the rebellion, to prepare dessicated vegetables for the soldiers, to keep off the scurvy. If any of you ever enjoyed a supper of soup made of these "desecrated vegetables," as we used to call them, and hard tack, while on allowance, you will hold them in fragrant remembrance as long as life lasts.

As I stated before, steam was used in the first Alden towers, and it has since been tried in a small way in towers; but its success was not satisfactory. Of late it has been used in a large way where the heat is distributed among the apples by a system of steam pipes, and it has produced very satisfactory results; in fact, it seems as though the hot air tower would soon be a thing of the past. After the steam is used in the evaporator it can be conducted through pipes in the working room, thereby doing all with one fire; also a cheaper class of fuel can be used. In the use of steam there are already many claimants for public favor, some of a good deal of merit, while others have their peculiar faults.

It makes but little difference what evaporator you use; the work is the same to prepare the apples. I have reports from men who own evaporators in many different places, and I find that fifty bushels is the average work for a single paring machine in ten hours. Where reasonably fair apples are raised some report as high as sixty bushels, and some even more. Two trimmers, one allowed to each parer; or it might be stated that to run an evaporator of 200 bushels capacity would take four parers, eight trimmers, two spreaders, two sorters, one bleacher, 5 tenders, one foreman and two night workers or about twenty-five hands in all. Of course this will vary a little according to

quality of fruit and skill of work hands. The product will be from 1,200 to 1,400 lb white apples, and you would use with the most approved steam evaporator about 1,200 lb soft coal, and from 20 to 25 lb of brimstone.

Great impetus was given to the business of evaporating fruits by the introduction of the method of bleaching the apples after being pared with the fumes of burning sulphur. It had been applied to hops, and in Europe to fruit to some extent, but it was introduced in the evaporator in this country about 1876. As it evaporates, so it bleaches. There are many styles but all accomplish the same work by burning sulphur.

In paring machines there has been great improvement since the one I used at paring bees. Some have even tried driving them by steam power, but we have yet to see any greater average per day than by hand power. I see it stated in the *Canadian Horticulturist*, of November, that apples pared faster than 25 bushel in ten hours will fly to pieces and waste. There are none of our boys that average less than 50 bushels, unless of poor apples, and some even as high as 75; yet we are not troubled in that way.

The importance of the enterprise to a community is shown, in a measure, by the amount of money that it puts into circulation, and not so much by the per cent. profit to the man or company who buy their apples and hire help to do the work. It is an industry that gives employment to every man, woman and child in the community, and that of the most active and energetic kind. Girls and women who at other times are driving in their carriages, as soon as the season appears, may be found in the dry house all day. It is not uncommon for the farmer to give to his girls the proceeds of the evaporation if they will run it, and some of them take in a good deal of money, even up to \$1,000 or more. As an example of the money brought into a place I will give you the sum paid out by one firm for dried fruit in the little village of Sodus, given to me by Mr. A. B. Williams, book-keeper for the year 1887:

3,500,000 lb. white apples at 7½c.....	\$262,500
300,000 lb. chops at ¾c.....	9,000
600,000 lb. skins and cores at 2½c.....	15,000
125,000 lb. berries at 22c.....	27,500
6,000 lb. plums at 10c.....	600
4,000 lb. peaches at 12c.....	480
	<hr/>
	\$315,080

Other buyers would easily have carried the sum total to half a million dollars. This buyer employed in his packing house the following persons from September 1st to April 1st, inclusive, seven months: one superintendent, one weigh-man, five packers, four facers and six ring pickers; seventeen persons in all. In packing the white apples they used 70,000 fifty-pound boxes, which loaded 140 cars, and it would require 30 car loads of half inch pine lumber to make the boxes. One box-making firm at that place write me that in the same year they made 75,000 boxes, using 32 car loads of half inch lumber, or 800,000 feet; 600 lb. glue, 2,500 lb. nails, and employed seven men and two boys. You will see by the number of persons required in an evaporator of 200 bushels capacity that it would require 1,200 persons for three months in the evaporators, to produce the white apples alone that this firm bought. Now I think I have shown something of the value of such an enterprise to a community.

Mr. J. Dayl, of Rochester, in an article read before the Western New York Horticultural Society last January, places the entire production of evaporated fruit for the year 1887 as follows:

Evaporated apples, 25,000,000 lb.....	\$1,125,000
Chops, 8,000,000 lb.....	150,000
Cores and parings, 4,000,000 lb.....	60,000
Raspberries, 750,000 lb.....	150,000
	<hr/>
Total, 37,750,000 lb.	\$1,495,000

Giving employment to 80,000 persons at good wages.

The question naturally arises: where do all these apples find a market? Dealers in New York write me that Germany and Holland are their largest purchasers, while those in Chicago say the great north-west and west. Parties in San Francisco say that

they ship to the distant islands of the Pacific, particularly to Australia. They say that just now they are having a large demand from Colorado, Utah, New Mexico and even Texas. Prices quoted in San Francisco on the 28th of November are: Evaporated apples, 9 to $9\frac{1}{2}$ c.; sun-dried quarters, 3 to 4 c., and sun-dried slices, 4 to 5 c. You will see by this that sun-dried apples cannot successfully compete with evaporated, and I doubt if expense of manufacturing is very much less. Perhaps I ought to say that there is an exception to this in what are known as "heavy cut quarters," sun-dried, from the northern reserve of Ohio. They are in demand in New York, and have the highest reputation for export.

It was said by writers and others last year, in a consoling way, that a result of the low prices would be to open new markets, and consumers in these new markets once having tasted the delicious fruit, would never again be able to resist. But careful inquiry among dealers fails to furnish proof of any such happy state of affairs, or to reveal any new markets opened. The consumption last year was enormous everywhere, but the general feeling is that there will be a great falling off this year. Western New York, the cradle of the evaporating industry, continues to lead the world, not only in the quality but in the quantity of its productions of evaporated apples and of raspberries. Delaware, North Carolina and Georgia are the leading producers of dried peaches, Virginia of cherries. Blackberries come from North Carolina, and apricots from California.

At the opening of the season this year there was a new disturbing element. It was reported that Germany had refused American evaporated apples cured on galvanized wire trays, and that buyers would pay one cent per pound more to those who used wood. As a consequence many producers put light ribs of wood over the wire, and the trade in wire cloth was completely paralyzed. But the price of apples was constantly advancing; buyers were excited and driving about the country night and day, buying everywhere and everything that they could find. It was soon rumored that those who had said the most were putting all into one pile, whether dried on wood or wire. It was found to make it much more expensive to dry on the wood. All of this caused a general feeling of distrust, and many took the wood off; very few are using it now, and I fail to find that any of the buyers are doing as they promised about paying more. The general feeling seems to be that it was all a hoax on a ruling by the German government against American food products in general. But in making a thorough investigation, I find that the complaint is well founded in certain cases at least. I will quote from those who seem to know.

Mr. P. A. Pincoffs, a member of the firm of Manran, Pincoffs & Co., Chicago, returned from Europe a few days ago. He spent some time in Germany, and was there when the question involving the healthfulness of American evaporated apples was raised in Hamburg, and says:

The action of the German authorities in this question is not due to jealousy or enmity shown by the German government in regard to food products from America. The measure against evaporated apples, in the first place, is not a governmental one; but is taken by the Hamburg local authorities, who certainly would and could have no possible object in discriminating against American evaporated apples for the protection of a home industry that does not exist. The facts in the case are simply these: A few months ago a case of sickness occurred in Hamburg, which was ascribed to the use of evaporated apples. The board of health, whose duty it is to examine all articles of food, thereupon took the matter in hand and examined over fifty tons of evaporated apples in the possession of various retailers. The result was that, on careful chemical analysis, a certain amount of zinc oxide was found in almost every lot. In most the percentage was very small, 0.004 per cent, and even 0.002 per cent., but in some it amounted to 0.43 per cent. The decision was then promulgated by the city government that all evaporated apples found to contain zinc or zinc oxide would be liable to confiscation, and the dealers handling them subject to penitentiary imprisonment, for selling articles harmful to the health of consumers. This measure might be considered an exaggerated one, as the percentage of zinc oxide in 90 lots out of 100 is infinitesimally small and cannot harm anybody; but the fact that some zinc oxide has been found in almost all lots examined stands uncontested, and is beyond any doubt—there a foundation exists for the action taken; it was not a feeling against American products, but primarily a feeling of paternal and somewhat exaggerated anxiety for the stomach of German consumers.

A similar case occurred in Amsterdam four or five years ago, since which time the use of evaporated apples in Holland has been falling off. Mr. E. Myers, a member of the firm of Myers & Co., produce exchange, New York city, writes me:

The use of galvanized wire trays has unquestionably, in instances, left traces of zinc poison in apples, and may easily do so; but we do not think sufficiently so to affect the consumer's health, unless, perhaps,

by frequent accumulative use. This, however, is more a question for the chemist than for the merchant. The complaints have come so far only from Hamburg and Amsterdam merchants, and there the government health officers have, in many instances, actually seized, analyzed and confiscated the goods and destroyed them. A merchant thus exposed to actual loss of all the goods that he may buy naturally stops buying, and as Hamburg has always been far the largest market for American evaporated apples, our export demand this year up to date (Nov. 17) has been almost nil.

From these quotations you will plainly see that the complaint is not one of national prejudice or of retaliation, but one of fact that has got to be met and remedied in some manner. Mr. Myers states that the return to "the use of wooden trays in evaporators, if general, would restore the business to its former proportions. Any extra cost in evaporating by this method would be readily compensated by the additional price that the goods would bring. Unless we can find a wire cloth so galvanized that the acid of the fruit will not affect it, it is clear that its use must be abandoned sooner or later. The fruit acid seems to have a close affinity for either lead, tin or zinc, and as one or all of these are used in covering the wire, it is clear that there *must* be a resultant trouble. The manufacturers of a certain grade of wire cloth claim that their silver finish high grade cloth is proof against the action of the acid. Of course, if it is well covered with silver, their claim can be sustained; but it strikes me that such cloth would be very expensive. The only metals in use that are proof against fruit acid are gold, silver and platinum. The new metal, aluminum, when it becomes cheap, as prophesied, will also meet the case. I think I should prefer to use iron wire cloth, as the iron rust cannot be called a poison, if I must use a wire cloth at all, unless the claims of the silver finish wire can be relied on, or return to wood altogether. Mr. Pineoff's further says:

As the matter now stands, evaporated apples cannot be sold in Hamburg unless the invoices are accompanied by a chemist's certificate stating goods to be free from zinc, so that the trade in the article there can be retained if a change is made in the process of manufacturing. But it may well be feared that if this change is not made, and further trouble is experienced in different parts of Germany, the German government will take the measure in hand, and having a solid argument against the article, will be only too glad to prohibit its importation into Germany unconditionally.

The following report is made by M. De Lafontaine, a reputable chemist, who has examined several samples of apples evaporated on zinc trays:

I have investigated the conditions under which zinc and zinc compounds find their way into evaporated apples, and find as follows:

1. The acid of the apple juice combines with some of the zinc of the trays and forms salts of zinc which remains on the slices.
2. The wires of galvanized iron used to make the trays have received an extra coating of zinc, which easily peels off when the wire is bent and mixes with the fruit.

This is a matter that cannot be passed lightly by. It certainly shows a very grave state of things. We cannot question the report of the chemists in Hamburg or Amsterdam, nor should we pass lightly by the report of M. De Lafontaine. If these apples are poisonous to the Germans of Hamburg or the Dutch of Amsterdam, can you tell me of any good reason why they should not have the same effect on the good people of Canada and the United States? If the suggestions of M. De Lafontaine are true, that it may come from the peeling off of the coating caused by the bending of the wire in weaving the cloth, then higher finish on the surface will not prove a remedy. It must be found in some other way.

I trust that manufacturers of evaporated apples will not blind their eyes to these facts, and that before another year the use of lead, tin or zinc cloth may be abandoned for something that will render the taint of poison an impossibility.

After brief addresses by ex-President Allan and Vice-President Morton the meeting was adjourned until 10 o'clock Wednesday morning.

THE QUESTION DRAWER.

On re-assembling at 10 o'clock on Thursday morning the proceedings were continued by the discussion of the following questions from the Question Drawer:

THE ONE JUDGE SYSTEM AT FAIRS.

Q.—Is it better to have one judge than three judges at exhibitions?

Mr. A. McD. ALLAN.—I would say yes; it is better to have one judge or two judges than three, for when there are three they stand in each other's way. Where there are three judges there is a strong temptation to shift responsibility of unsatisfactory decisions from one to the other, but no man will undertake the duties of a sole judge unless he feels himself fully competent to do the work. I prefer two judges to three, because, where there are only two, the judgment must be unanimous. In my own department I would far rather judge alone than with two assistants; for my experience has been that they are anything but assistants.

Mr. ELLIOTT agreed with Mr. Allan that the one judge system was preferable, and had been tried with most satisfactory results by the Union Society of North and South Essex. He was not in favor of two judges.

Mr. WILLARD, of Geneva, N. Y., said that in his part of New York they had always adhered to the three-judge system, but he was free to admit that the one-judge system would have many advantages, provided the person could be found who was willing to accept the whole responsibility.

President LYON, of the Michigan Horticultural Society, said that with them the one-judge system practically prevailed, although it was the custom to appoint an assistant who had local knowledge to guide him on some necessary points. The real responsibility, however, rested with the one judge, the aim being to put the judging in the hands of a known expert.

Mr. WILSON, of Chatham, agreed with what had been said in favor of the one-judge system. Under the prevailing plan the only man competent to judge an exhibit might for local or other reasons be outvoted by the other two judges, who really were not competent, and this was a deterrent to really competent men when asked to act.

Mr. READ, secretary of the Michigan Horticultural Society, said he had seen the one-judge system in operation at county fairs, and had heard no more complaints than when there were two or three judges. He coincided in the view that one expert was much better than three non-experts, or one expert and two non-experts whose judgment might weigh the former down. He thought it a very good plan to have one expert judge assisted by some one of local experience to help him in some matters.

President LYON stated that at the exhibition referred to by Mr. Read they had secured the services of three judges, thinking they would find an abundance of work each by himself, but there seemed to be a tendency on the part of those gentlemen instead of dividing the work to go on and throw part of the responsibility on each other, although that was not at all the purpose of the society.

FRUIT ROOMS AND STORAGE OF FRUIT.

The following paper was read by T. T. Lyon, of South Haven, Mich., President of the Michigan Horticultural Society:

There are two, in some respects, distinct purposes for which fruit retarding arrangements are more or less employed. That to which we will first give attention is for the temporary holding of the earlier and more perishable fruits. These, owing to their very perishable character, can only be retarded for a comparatively short period; and experience had developed the fact that even with the arrest of decay the flavor deteriorates more or less rapidly, so that little or nothing is to be gained by more than a very temporary holding of such.

The process, whether with early or long keeping fruits, consists in keeping them in an equable, moderately dry condition, a few degrees above the freezing point. This low temperature may be produced by different methods, although it is usually secured by the use of ice, in a room with double walls, ceiling and floor, packed between with dry sawdust or other cheap non-conducting substance, or by the use of what are known as dead air chambers.

Since the warmer air is always found in the upper part of the room, the ice box is placed there; and since the gaseous results of decay are heavier than atmospheric air, the opening, if any, provided for their removal should be placed very near the door of the room. The ice box will necessarily be the coldest object in the room, for which reason any excess of moisture in the air of the room will be condensed upon it, and this will the more readily occur if its surface is of metal. It must therefore be supplied with the means of collecting such condensed moisture, together with the drip from the ice, and carrying the same outside the building; the discharge pipe should be provided with a trap to prevent the admission of the warmer air from without.

The fruits to be held should be in as perfect a condition as possible; rather under than over ripe; and may be in moderate sized packages, or placed directly upon shelves. Bruised or decayed fruits should be rigorously excluded. Such arrangement will be found useful also for the preservation of perishable culinary and other articles.

The arrangements for the preservation of the longer keeping fruits differ from the foregoing mainly in dispensing with the use of ice; and, instead, securing the needful low temperature by employing a system of ventilation, by means of which the outer air may be admitted, when its temperature is low enough for the purpose, excluding it at other times. The fruit should be gathered with the utmost care, when not over ripe, all bruised or decayed specimens excluded, and the packages placed at once in the retarding house, the temperature of the same having been already reduced as low as practicable by opening the ventilators during cold nights and closing them before a rise of the outer temperature. The effect of this will be to avoid the continuance of the ripening process consequent upon the comparatively warm weather which so frequently occurs after fruits are gathered, bringing the fruit thus treated down to the final advent of winter, slightly if at all changed from its condition when gathered—an important point gained, especially in the more southerly portions of the apple growing regions of our country.

A building for this purpose may be constructed of cheap material, if only the work of packing or insulating be so thoroughly done as to effectively avoid circulation of air, save when admitted through the system of ventilation.

Admission to the room should be through double doors, and light should be admitted only when needful in conducting operations.

Fresh air is admitted through a passage from beneath at some central point in the fruit room which should draw its supply from the free outside atmosphere, and should be susceptible of being easily and tightly closed at pleasure. This passage should extend to near the ceiling, admitting the incoming air only at that point: which will thus displace the warmer air which will have risen to that position.

Carbonic acid and other products of decay will, if present, occupy the lower portions of the room. To insure the removal of these the pipe for the discharge of the outgoing air should start from near the floor, passing up through the attic and above the roof, but with its principal opening at or near the ceiling, to be used for the removal of the warmer air, when the temperature is to be reduced. These passages also should be kept tightly closed, except during the process of ventilation.

If both air ducts are opened when the contained air is warmer than the outer atmosphere, the warmer air will pass freely upward and be as freely replaced by the cooler air from the lower duct. This process will continue till the temperatures within and without the room are equalised.

It may, however, become desirable to change the air of the preservatory when the temperatures are such that a spontaneous movement of the air cannot occur. To provide for such necessity the upper ventilating duct should be of metal—ordinary sheet

iron will suffice— and in the attic a sheet iron jacket may be placed around it, in which a light fire may be built, the heat of which will at once occasion the draft sought, and the air of the room below be rapidly changed as heretofore described.

Fruit may be stored in such rooms in common barrels, which may be piled one upon another, when the vacant spaces will be ample for the circulation of air when needful for the purpose of ventilation or change ; or it may be stored in open bins, in which case the bottoms should be of slats, with ventilating spaces between, and an open space left for the free passage of air between the bins and the floor, as well as between the bins. In the case of small lots, or of specimen fruits, they may be spread or placed in shallow piles, upon shelves or tables, so as to be open to convenient examination when desired.

A large building of this character will be the more easily maintained at the proper temperature, since the greater bulk of air will vary in temperature more slowly in response to the changes without.

In localities in which the winters are so steadily cold that there is liability of the temperature being reduced to the danger point without the opportunity to avoid it by renewal, the air may be introduced through an underground passage well below the frost line, and a change of air thus safely effected even in the coldest weather.

Fruit exposed to a dry atmosphere is more or less inclined to shrivel and become tough and leathery, as well as to lose flavor. This is especially true of the Russets. For this reason a moist condition of the confined air is found preferable, since in such atmosphere fruit loses little if any of its moisture.

The Michigan fruit shown at the opening of the Centennial Exposition at Philadelphia in May, 1876, which at the time attracted unusual attention, had been largely kept in a building of this character. When placed upon the tables it had undergone so little change that even the stems in most cases were still fresh and green.

The freezing of apples does not occur till the temperature has fallen several degrees below the freezing point of water, nevertheless it is claimed that the best results are realised in temperatures somewhat above that point.

The more limited operations of farm orchardists, as well as the large class of smaller commercial growers, call for arrangements of less elaborate and expensive character than those already described.

With the great majority of these the cellar is the chief reliance for the storage of long keeping fruits. This, however, can only be rendered satisfactory for the storage of winter fruits by devoting it wholly to such purpose, to the total exclusion of vegetables and other articles liable to infect the confined air with foreign odors ; and by such ventilating arrangements as shall suffice for the maintenance of the needful low and constant temperature. If preferred a portion only of the cellar may be devoted to such purpose, and partitioned off by a brick or stone wall, all the better if double. If located beneath rooms artificially warmed, precaution will be necessary against the transmission of warmth to the cellar below.

The most convenient and effective device for the amateur or family to be devoted to the temporary storage of summer and autumn fruits, for ripening, testing and occasional retarding for short periods, would be a room, either within or separate from the residence, constructed upon the principles and (excepting the ice) with the fixtures already indicated, in which fruits can be placed either in packages or upon shelves, the latter being preferable, when the specimens are for testing, and which for that reason require frequent examination.

To those, however, who provide for a supply of ice during the warm season, a simple, small room or cupboard built within the ice house, with admission from without, through double doors, will be found effective and satisfactory for the holding of summer fruits, the preservation of specimens for fairs, and other kindred purposes, as well as for the preservation of various domestic products.

Mr. A. McD. ALLAN—I do not know of any subject that could more appropriately be brought before fruit growers and shippers than that on which President Lyon's paper treats, and the points contained in the paper are those which it is absolutely essential

that every grower and shipper should have a knowledge of. The shipper is interested, because he wants to get that fruit in the very highest condition of perfection for shipping, and he cannot get it in that condition unless it is stored under the circumstances mentioned in the paper just read. I would therefore very much like that growers would carefully study and observe the principles laid down in it, because by doing so they will be improving their own interests as well as those of the shippers and the country at large. The subject is a most important one and should receive the attention of all fruit growers.

Mr. GARFIELD—I would like to know if there is any means of getting rid of the surplus moisture in case we want to preserve products to be kept dry. In the case of apples, I understand it is better if the atmosphere is a little moist, but if we were going to use the same storage room for squashes or onions we would desire the atmosphere kept continuously dry. How are we going to get rid of that moisture?

President LYON—There is a great deal of matter that might have been introduced into the paper which was left out, partly because it was thought it would serve to excite discussion in which those points would arise, and also that it might not be of too great length. In answer to Mr. Garfield, I may say there was an arrangement such as I have described for gathering the condensed moisture, and the room was kept dry by just that simple process. The ice box was so arranged that all the moisture as it dropped down was caught and carried away, and the air of the room certainly was very satisfactory.

Mr. GARFIELD—My question referred to that style of rooms where they do not use ice, where, when you let in air, you let in moisture, and when you keep the air there still, there are exhalations from the onions or squashes which fill the air. Is there some way of bringing that out?

President LYON—I do not know whether there is anything better than the practice of having substances in the room that will absorb the excessive moisture. Of course that absorption can be carried to any extent that is desirable. I believe that the refuse of salt making is used for that purpose, and has the property of absorbing moisture with great rapidity.

PEACH GROWING FOR PROFIT.

The President then called upon Mr. James F. Taylor, of Douglas, Michigan, to read a paper on "Peach Growing for Profit."

This subject may have reference to the great peach belts of our country, where the cultivation of this fruit forms the leading industry, or it may only include those smaller districts where a few hundred trees are grown in connection with the grain products of the farm. There are small peach belts, of a few acres in various localities, well adapted to the successful cultivation of this fruit. This is especially true where the surface of the country is broken by hills and ravines. Ridges of land that run well up above the rivers and plains and swamps are often exempt from the coldest extremes of winter and the severest frosts of spring. If these ridges and hills have a porous subsoil they are all the better adapted to the growing of peach trees that will produce an abundance of fruit.

In selecting a situation for a peach orchard it is desirable to avoid very frosty localities. The air currents which seem to keep up a constant motion in an undulating country, often afford protection from injury when all other devices fail. Perhaps severe frosts, late in the spring, after the fruit buds begin to develop are more fatal to peach culture than the coldest days of winter. On this account localities should be selected where the fruit buds will not be too much influenced by the warm days of early spring time. Sheltered localities therefore like the south side of woodlands, are not often desirable. An open exposure is preferable, so that the cold winds of spring time may retard all tendency to growth until danger from frost is over. Special reference should also be had to character of the soil and its preparation for trees. A very strong soil is always to be avoided. Loam, sand and gravel mixtures are preferable to clay. Peach wood seems to be much more capable of resisting cold when it is brought to maturity by a slow

growth. This can only be secured by a soil that is moderately productive and somewhat porous in its nature. On such a soil clover sod plowed under in the autumn or early spring and well fitted for corn will be in good condition for planting peach trees.

The trees may be planted 16, 18, or 20 ft. apart each way. If the land is strong 20 ft. is not too far, as the trees become more spreading and do not grow so high. With peach trees corn should be planted for two years with good cultivation. After this rye or buckwheat may be sowed and plowed under to good advantage. Cultivation should continue year after year as thoroughly as for a crop of corn. Peach trees will not bear neglect and give good results. During every dry season cultivation should be continued until the middle or last of August. After the trees begin to bear fruit, fertilisers may be used to good advantage on any soil, and on all light or thin soils they are a necessity. The tree that bears good fruit must be fed or it can not feed others. The best varieties for these isolated orchards are doubtless the old standard sorts that have been tested in all parts of the country. With these some new ones are coming to the front to make the list about as follows for continuous ripening:—Lewis' Seedling, Crane's Yellow, Early Barnard, Jacque's Rare Ripe, Hill's Chili and Smock. Some other varieties we think equally good, but this list is long enough for a beginner. Before planting a peach tree it should be trimmed to a whip and cut back to 3 or 4 feet in length. In trimming cut the limbs about one-half inch from the body of the tree so that buds hidden there may not be injured. During the summer after planting superfluous sprouts may be taken off or pinched back from time to time as they appear. In this way trees become shapely without severe pruning. The cultivation of a peach orchard is never complete, unless a thorough search for borers is made once or twice a year.

When the fruit sets full it should be thinned out by hand picking. This work can begin on the early varieties, when the fruit is about like your finger ends, and continued on the later varieties until all have been gone over. When the fruit sets uniformly over the tree it should be thinned out to 3 or 4 inches apart on every limb. Good results can not otherwise be secured.

When the crop is abundant great care must be exercised in marketing in order to secure good results. Peaches are always of better quality when ripened on the tree, and the nearer they can be brought to this condition before they are picked for market the more they will be appreciated by the purchaser. These small orchards, scattered over the country, as good locations offer, will commonly find their most remunerative market near at home. If the price is low in these markets at first it can be reached without middle men, and as the well ripened fruit is presented year after year it will be more and more desired by all who see it. For the home market peaches may remain on the tree until they are well ripened, but for long shipments no soft specimens should go into the package. Peaches should be handled about as carefully as you would handle eggs. Pouring them from one basket or box into another, as you would potatoes or even apples, is highly injurious, even if the injury is at first invisible. It is therefore desirable to pack them for market where they are grown. Pecks, halves and bushels may be used to advantage in this traffic according to the kind of market and quality of fruit you wish to put upon it.

With this brief outline we think no one will be at a loss to improve his opportunities for peach culture in a way that will be healthful to the digestive organs of his customers and remunerative to his own purse.

The net results of peach culture in any locality are variable to an extent that can not easily be defined. The estimate may be made by the tree, or the acre, or the orchard, and in any case be misleading as to the results during a series of years. If a tree five years old produces one bushel of marketable fruit, which would be a reasonable estimate, we still have the wide variation of prices that come from an abundant or short crop. The actual results therefore are similar to other branches of horticulture and husbandry; sometimes good and sometimes not so good, but where Nature serves the kindly turn of a congenial climate the careful and judicious cultivator of peaches seldom fails of a suitable reward for his labor. The most favored localities are not richly rewarded every year, but wherever the trees and buds can endure the climate there is always great encouragement to plant the trees and gather the fruit.

At the end of his paper Mr. Taylor continued speaking as follows: When there is a surplus, if the fruit is properly handled, it is very seldom the net returns would not be equal to one dollar a bushel—I am speaking of a very abundant year. Peaches are now being used through the country wherever they can be produced to an extent that justifies their production wherever there are facilities for their transportation. Rapid transportation is very desirable when the crop is large. When the crop is small of course the prices run high, as has been the case this year, two, three, four and five dollars per bushel according to quality and the condition in which the fruit was placed upon the market. But we do not regard \$3 and \$5 as standard prices, because it is only occasional years that we have not a sufficiently abundant crop to enable us to reduce the price below those figures. I have not written anything in regard to the yellows, not knowing whether you would care to hear anything about it. I have been asked by different members whether we have the yellows, and I will just reply to that in a few words, and then I shall be very happy to answer any questions you may desire to ask. We have had the yellows. They commenced first in my place in 1877. I had two or three trees affected that year, and through not fully appreciating the disease at that time, and having my attention drawn away by other work, they were not cut until after the fruit had ripened. I had only about three hundred trees at that time, but the next year forty of them were affected. These trees were green and fresh in leaf as any orchard could possibly be, showing no change of color in the leaf or growth of the tree, but when the time had nearly come for the fruit to ripen it showed that peculiar red that is familiar to everyone that has ever had any fruit affected by yellows. We cut out the forty trees, and the next year we had six, and since that year we have not found the yellows in our orchard at all. A neighbor of mine, in the year in which we cut forty, cut three hundred trees, and for several years past he has not had more than an occasional tree. That is the history of the disease in my immediate vicinity, in a district of country several miles wide and long. In other localities where, instead of cutting the trees, they persisted in trying by various means to doctor them, hoping to cure them of the disease, it continued to exist, and spread. Now the growers are so thoroughly convinced of the necessity of taking out every tree that shows sign of the yellows that there is no objection to that course at all. We have commissioners whose duty it is to see that affected trees are cut out. I was one of the commissioners for my township for six years, beginning with 1878, and so I made myself familiar with the spread of the disease in that locality, and with its curtailment from that time down to the present, and the young orchards in our vicinity for the last six or seven years do not show any symptoms of yellows at all.

President LYON.—What would you do in the case of a single peach on a tree showing symptoms, while the rest were sound; would you simply cut away the branch?

Mr. TAYLOR.—I have occasionally heard of cases where men saved the tree by cutting off the limb, but I have never found any such instance myself. I had an Early Crawford, one limb of which, about the size of a hoe handle, showed the disease, and I was not willing to risk it and we took the tree out. I think there are few who will contend that the disease has not already taken hold of a tree that shows it on one peach this year sufficiently to develop it on a large part of the tree the next year. I have seen a man who had one limb or one side of a tree which forms principally in two branches affected by the disease, and it was cut off and the other side ripened healthy fruit, but next year the remaining side had the yellows just as badly as the first, and that experience has been repeated so often within my personal knowledge that I would not risk one branch on a tree, even if it was not larger than a pipe-stem. Peach trees at the present time only cost a few cents, and it is better to put in a new tree than run any risk of the disease spreading in the orchard.

The SECRETARY.—Do you think it can be carried by pruning tools? Is care necessary with regard to the use of the pruning knife?

Mr. TAYLOR.—That is one of the points that has been a great deal talked of, but I am not in possession of any certain knowledge either way, as to whether it is carried by

the tools, or if it is necessary to use any acid or anything of that kind on them. It might be necessary if the pruning were done when the tree was in flow of sap, but our trimming is done early in the spring, if possible before the sap begins to flow.

A MEMBER.—Do you burn the trees as well as cut them out?

MR. TAYLOR.—Our law requires the burning of the tree. The year we cut so many trees we were particular to pick up the fruit and give it to the pigs, but my orchard was so thickly planted that it was impossible to carry out the trees without brushing the other trees, so I left them until the fruit was picked, and then we destroyed trees and all. We did not take out the roots, however, until our fall work was finished, and then we dug out all the stumps. Where that is done there is no trouble at all. We regard the burning of the trees, after cutting, as an essential part of the work.

A MEMBER.—Would you plant new trees in the places where the old ones came out?

MR. TAYLOR.—We have done that with good success, as far as any yellows were concerned; there has been no effect as far as the yellows were concerned. You all know, however, that there is a difficulty in starting a young tree surrounded with old ones. If your trees are sixteen or eighteen feet apart the roots of the old trees so occupy the ground as to take the life out of the soil, and a young tree may fail the second year from causes entirely apart from the yellows; that is the only difficulty we have had in that line. I know of perfectly healthy trees, bearing fruit, which were planted in places where other trees affected by yellows were taken out.

PROFESSOR PANTON.—What has been your experience in planting the pits of diseased peaches?

MR. TAYLOR.—I have cracked many of them to see if there was anything there to grow; I think when the fruit is thoroughly diseased there is no meat in the pit to grow. Where a tree is diseased on only one side the pits of the fruit from the other side might grow, and it is just possible that if those pits were already infected with the virus of the yellows it might be injurious.

A MEMBER.—At what season of the year do you plow in the buckwheat?

MR. TAYLOR.—There is a two-fold object in plowing under buckwheat, one is to get the vegetable matter under to fertilise the soil, and the other to counteract the working of the cut-worm. Buckwheat seems to be one of the crops the moth of the cut-worm does not like, and the more we sow buckwheat that way the less trouble we have with the cut-worm.

A MEMBER.—Don't you find that your late cultivation is very apt to induce a late growth, leaving your trees and buds in a tender condition for the winter, and so liable to winter-kill?

MR. TAYLOR.—The error in peach cultivation is the other way. My experience is that the cultivation of a peach orchard ought to be late enough in the season so that the fruit buds will not ripen before about the middle of September. Stop cultivating in July, and on ordinary dry soils the leaves will show ripening in August and turn yellow. As the leaves ripen the fruit buds for next year begin to develop and show. Suppose we have a warm September, these fruit buds will enlarge all through the fall if it is warm. Now if the growth is kept up on these trees until the 1st of September, if it is a dry season especially, cultivation is desirable, and if they have fruit more desirable still, because the quantity of fruit and dryness of the soil will produce earlier ripening of the wood. After the wood is once ripened the nature of the peach, if the soil is warm enough, is to start again. A December like the present continued on through January would bring out peach buds on the lake shore altogether too early. We have had one such season since I have been on the shore in twenty years, when the peach blossomed on the 10th of April—the only season in the twenty years when the peach has blossomed before the 10th of May. The trees did well enough, only the cold winds and rains of May stopped the growth of the tree and the fruit for a week or ten days. Then it came warm again, and the new growth threw off not only leaves but fruit that year. The damage done in that way induced a number of men to go to extremes in cultivation. If up to the middle of July we get continuous wet weather, let the cultivation be cautious.

from time to time, but if dry weather continues do not be afraid to continue until you are pretty sure the dry season is over. We must keep up moisture by cultivation if we cannot get it from the clouds.

A MEMBER.—What implement do you use for cultivating?

Mr. TAYLOR.—My own practice is to plow the orchard once every season; near the tree we use a one horse plow, and back from the rows either a gang plow or a single plow set very shallow, not more than four inches deep.

The SECRETARY.—What style of package do you use in Michigan?

Mr. TAYLOR.—We have tried almost every style that has been on the market. For a number of years past the successful package is a round basket with what we call a railroad cover. Then in our immediate vicinity we have the four-basket crate of slats, with a slat cover on top to hold the four together. During the last two years the long basket with a handle has become quite popular: the commission men in Chicago are preferring that one very much, and we may be obliged to adopt it.

The SECRETARY.—I have just a word or two to say regarding the distance apart of peach trees. Mr. Taylor puts the distance at twenty feet. That was the distance at which we originally planted our old orchard, but of late I have been planting about twelve feet, and by careful pruning I keep the tree in a bushy form. I find this distance to be quite far enough apart, especially in view of the danger of losing the trees by yellows. It seems advisable to keep our ground more closely occupied and the trees severely pruned. We have all noticed where we have neglected to prune the peach tree, that it runs out very long arms, with all the fruit on the straggling ends of long branches, and of course they occupy more ground than is necessary. I think the mode of pruning I speak of not only keeps the tree in better health, but we get a greater number of fresh young shoots and more fruit. Then in regard to fertilisers, I have been using wood ashes altogether for my peach orchard, and I have been exceedingly pleased with the result. I believe it affects the color and size, and perhaps the flavor of the fruit. So much is this the case that I daresay some of you have noticed that in Massachusetts it is claimed by Mr. Hale that muriate of potash is a specific cure for yellows, which, however, we have very great doubts about.

A MEMBER.—What time of the year do you prune?

The SECRETARY.—I prune in March or early in April, before the growth begins.

Professor PANTON.—What quantity of ashes do you apply?

The SECRETARY.—At least half a bushel of unleached ashes to a tree yearly. The soil is sandy loam.

A MEMBER.—Do you keep ashes close up to the trees?

The SECRETARY.—No, decidedly not; we scatter them on the ground under the tree, out nearly as far as the limbs extend. Then with regard to thinning the fruit. I believe, though I never can find time just at the period of the year, that judicious pruning and shortening of the ends of the bearing wood early in the spring, and thinning out all the sickly wood, will accomplish that object as well as any other way.

A MEMBER.—What is the best time of the year to look for the grubs of the Peach Borer?

Mr. TAYLOR.—As soon as the frost is out of the ground in spring, so that you can do it conveniently, and then during the summer just before the eggs are deposited again for the new crop. If whitewash is used with some carbolic acid it is likely to keep them away.

A MEMBER.—We have always looked for borers about the month of June.

Mr. TAYLOR.—Well, I think I should take a little later time than that, because so long as the insects are flying around depositing eggs in the bark of the tree it is hardly worth while to go around and pick them out. But if gone over at that time with a brush great good will be accomplished in keeping them away. I would sooner go around a little later than that, before much damage is done. I think if you wait until late fall much damage is done.

The SECRETARY.—It is simply an egg that is deposited in June, and you could not find the egg at that season.

Mr. TAYLOR.—As soon as they begin to do damage the sap that oozes out will form a gum around the tree, and then you may be sure there is something wrong about it, and the more gum there is the greater the damage, because it shows the tree has been more severely injured—the first little indication shows that there is something wrong. If you find a little hole trace it right down with the point of a knife.

The SECRETARY.—With regard to the borer, I think the best way is to keep him out altogether. It is a great deal of trouble to go over a peach orchard and hunt out the borer after the breeding season. I think most of the gentlemen present are aware that the moth deposits the eggs in the months of June, July and August, and that the egg is deposited about the surface of the ground, in order that the grub may find its way into the root, which is the tender part, and where it most delights to live and work its mischief. Now, if we can prevent the moth from reaching that part of the tree we shall save the tree and save ourselves considerable hunting for the grub, and even when we do hunt they sometimes escape us. I have found it the simplest and easiest plan to put a bank of earth around the trees, which can be done by a man with a spade very rapidly. By doing this about the first of June or earlier the moth is entirely beaten. If the egg is deposited in the dry bark of the peach tree higher up it will do little or no injury. I have had very little trouble with the borer since I adopted this method.

Mr. F. W. WILSON.—Would that work all right with apple trees too?

The SECRETARY.—No, because the borer can work anywhere in the apple tree.

A MEMBER.—Is not the effect of heaping the earth around the tree in the way you describe, to make the bark tender, and will not the grub be able to work on it there?

The SECRETARY.—I have never found it work in that way.

Mr. CASTON.—How would it do to wash the tree with some alkaline solution? I do not know how it would work with peach trees, but it is a very effective remedy with the borer in apple trees.

Mr. McMICHAEL.—I had a three-acre orchard of Northern Spy apples banked around, and in the spring the frost or rain had made a little trough, and I nearly lost some trees; they turned black in spots.

The SECRETARY.—If the mound of earth is put closely around the tree and packed close to the trunk I think it would shed the water. I do not think you could have had it packed closely.

Mr. TAYLOR.—I would like to say something about that banking up, because we have practised it. You take a peach tree in its second or third year, it has quite a top, with pretty heavy foliage, and a tree that is banked up will sway in the wind until at last it makes a little cavity around the trunk which forms a very nice place for water or anything of that kind to lodge in, and necessitates re-banking before the ground is frozen. We have had our trees barked at the bottom from swaying against the frozen ground. We have also had that cavity filled up with water running down the tree, when ice would form there; and many of our growers find there is considerable risk in banking peach trees if they allow the banking to stand during the fall and winter. If the borers are looked after during the summer months, and kept out until the tree gets large and the bark hard, there is not much difficulty after that in keeping them out; they don't have much effect on a tree eight or ten years old. It is while the tree is young that there is trouble in keeping them off.

The PRESIDENT.—Mr. Woolverton's plan is to bank in the spring, and that obviates the difficulty with frost in the winter.

QUESTIONS ON PEACH CULTURE.

(1) What list of six kinds pay best in the county of Essex?

Mr. MITCHELL (Leamington).—I may say the borer is one of the greatest troubles we have in this section of the country, and I have come to the conclusion—though I have never tried it—to take a piece of stovepipe or sheet iron and put it around a hoe or rake handle until it is tight and then spring it and put it around the tree, and as the tree grows the pipe will expand with its growth.

The SECRETARY.—I might mention here that a firm in Hamilton have prepared wire cloth especially for that purpose, and I believe it would work very well.

The PRESIDENT.—What varieties are cultivated here?

Mr. MITCHELL (Leamington).—Well, the Crawford is a very fine peach, but it does not yield enough returns. I think the Smock is one of the best, but Reeve's Favorite is one of the finest and most productive I have ever planted. Almost every variety succeeds where I live. Good cultivation is one of the principal objects in getting good peaches; I do not believe in putting a crop in the ground, but in plowing it.

The SECRETARY.—Why don't you grow the Old Mixon?

Mr. MITCHELL—Because it is so unprofitable; if we get a dozen off a tree it is the outside in a good year, and two years out of three we don't get any.

The PRESIDENT.—Can you give us any idea of the extent of peach growing in your locality?

Mr. MITCHELL.—I know one gentleman who has 18,000 trees. He must have picked this year in one week about 2,400 baskets of one variety. I think he averaged about 400 hundred baskets a day of one variety. It was originated, or he got it, near Ridgetown. It is a yellow peach of very good flavor, and with a small pip; medium early, ripening a little after the Early Crawford. It is called the Tyhurst Seedling.

The PRESIDENT.—Would you advise anyone planting a peach orchard to plant it?

Mr. MITCHELL.—Most decidedly I would.

Mr. ELLIOTT.—Has anyone else got it?

Mr. MITCHELL.—No, unless he has let them; no one has it in bearing. The gentleman I speak of has shipped peaches from his place by the car load.

Mr. BALDWIN (Essex).—I commenced by propagating seedlings from a tree. Some of my neighbors told me I could not propagate the Crawford from the seed, but I can show as fine Crawfords in my orchard as can be seen anywhere propagated from that tree. I have the tree the last speaker tried to describe (Tyhurst's Seedling). It is a very profitable tree to have in an orchard, and will produce itself from the seed. I find I can derive more profit from my own trees than from those I buy from nurserymen. I have the Waterloo, the Early Canada, the Schomacker, Alexander and several other varieties.

BEST VARIETIES OF PEACHES FOR NIAGARA DISTRICT.

The PRESIDENT.—I see I am down on this subject, and I may say we grow there as a standard the Crawford. The question asked is, The best six varieties. We would take for early the Alexander, or it does not matter much if we take one of those others, the Schomacker or Early Canada. That is our first peach, and the Early Rivers is our second. Then after Crawford's Early I think a good deal of the Wager, which comes in immediately afterwards, and is a profitable peach. After that we have a local peach called the Bowslough, a very fair peach, and one of the surest of any we have for a crop in that locality, I think. The Late Crawford is a good peach when we can get it, but in a great many localities it is a poor bearer. I have been very favorably impressed during the last season with a peach about which I think our friend Mr. Willard, of Geneva, N. Y., can tell us something. It is called Steven's Rare Ripe: it is the Old-mixon over again, but a week or ten days later, and, with me, a much better bearer. The Wheatland is considered first-class when we can get it.

A MEMBER.—What about the Foster?

The PRESIDENT.—The Foster is similar to the Early Crawford: it would puzzle some folks to tell the difference, though it has generally a little rounder form and higher color.

A MEMBER.—Could you detect the difference between it and the Wheatland?

The PRESIDENT.—I think I could.

Mr. WILLARD.—Steven's Rare Ripe is an old peach, and yet a comparatively new one. The results attained by a gentleman on the Hudson river in producing that peach were so wonderful that it attracted considerable attention. I think the peach was noticed twenty years ago, but, like many other good things, it has been lost sight of.

until now. It is sufficient for me to say that the greatest returns I have ever read of were obtained from that peach on the Hudson river, and it has been growing in favor very rapidly. It is a late peach, coming in just before the Smock—a large, fine white-fleshed peach, usually red on one side and very productive, and the fruit-bud seems to be hardy. We had a very fine crop of them this year, which we sold in Buffalo at 85 cents to \$1 per peck basket. You can judge from that how it is received in the market. It is becoming with us, or has already become, one of the standard varieties. The quality is good and people want it; it is a free-stone entirely.

Rev. C. N. MATTHEWS (Kingsville).—What about Hynes' Surprise?

Mr. WILLARD—I think I was the first in New York to grow it. All I have to say is that it is all that it is claimed to be. We have marketed two crops and sold them at very satisfactory prices. It is one of those early peaches following the Rivers that is absolutely a freestone—something it is difficult to get. Hynes' Surprise is absolutely a freestone.

A MEMBER.—Do you ripen the Catawba grape where you are?

Mr. WILLARD.—Yes; we have ripened the Catawba grape at Geneva.

EXPERIENCE IN PEAR CULTURE..

The PRESIDENT called on Mr. J. K. McMichael, of Waterford, Ont., to give a paper on his Experience in Pear Culture.

About twenty-five years ago, while we were planting a plot of three acres with Northern Spy apple trees, we set in one corner of the orchard a dozen pear trees. The soil is a sandy loam, slightly facing to the south. We had a variety of six or seven kinds in our group of pear trees. The best return we have had in profit from any one of the trees, has been from a seedling grafted with Bartletts about seventeen years ago. The Winter Nelis proved to be a shy bearer and an uncouth tree, but free from blight. A fine Howell tree blighted badly nine or ten years after being planted, and the whole top had to be taken off to the trunk; some sprouts grew, however, and the tree now is one of the largest in the group, producing fine, saleable fruit. Two trees of the Early Harvest were fine growers, maturing heavy crops of fruit, but not giving satisfactory returns in cash; they were, ten years ago, grafted with Bartletts, and are producing large yields of first-class fruit. Clapp's Favorite has been a fine growing tree, giving a quantity of large No. 1 pears; but the past season it was severely blighted. In this plot, by planting trees from the nursery, we have not been successful with either the Bartlett or Flemish Beauty, but the fruit has rarely been affected with a fungus.

In Plot 2 the soil is limestone and sand, and gently slopes to the south. In 1871 we planted in one corner of this orchard fifty pear trees. Two or three of the varieties were sadly disappointing when they gave a return in fruit. Instead of the order as sent to the nursery being filled and returned true to name, the nurserymen claimed and took the right to substitute other similar kinds to the ones in the order, when they did not have the varieties ordered in stock. The consequence was that some of the substituted varieties were worthless in the locality sent. The Bartlett trees planted in this soil made but a small growth. The fruit has been mostly free from blemish, and a fair-sized sample. The Flemish Beauty shows a fair growth of tree, but the fruit is considerably blotched, and in size and quality is No. 2. The Lawrence is a poor growing tree, and yields a small quantity of fruit of medium sample. Clapp's Favorite is a large, fine growing tree, with heavy crops of first-class fruit, but is blighted badly. Beurre Bosc is a fair growing tree with very heavy crops of large No. 1 fruit. Beurre D'Anjou, a fine tree but a shy bearer.

Plot 3 is located on the north side of a somewhat sharp-sloping ridge running east and west. The upper side of the field is a sandy loam, and the lower side clay. Formerly the land was very wet from spring water oozing out above the clay, but since underdraining the land has been very productive. In this plot we planted 100 Bartletts, 25 Flemish Beauty and a few each of half-a-dozen other varieties, making a total of 154

pear trees. For a few years we found it necessary to cut off a part of the year's growth, to keep the trees in shape, and the fruit, especially that of the Bartletts, was remarkably fine. At this time a part of the orchard was severely stricken with the blight. In the southwest corner of the orchard stood a large apple tree which was very badly diseased with twig blight, and to the northeast from the apple tree, among the pear orchard, nearly every tree was apparently almost ruined with blight. We removed the apple tree and burned the diseased portion of it. From the pear trees we sawed off all the affected limbs below the discoloring of the bark and burned them. The trunks and remaining limbs of the trees then received a coating of raw linseed oil. Similar treatment was applied to the trees for the succeeding two years, and that trouble disappeared until the past season. In this plot, eight years ago, the Bartlett, Flemish Beauty, and some of the other kinds were attacked with the *Phytophthora*, and for two years we did not find a single specimen from the Flemish Beauty that would be saleable. The Bartlett pears were not quite so bad, but the trees suffered very much worse than the Flemish Beauty. The Bartlett trees suffered so severely that the limbs were nearly black and waxy to the touch from a gum-like substance that oozed out of them. Three years ago last spring, before the pear trees were in leaf, we sprayed them with a solution of hypo-sulphite of soda and water, using one pound of the sulphite in ten gallons of water, and continuing the application every two weeks until the fruit was about half grown. The Flemish Beauty was remarkably free and fine from blight, and the Bartlett trees rallied up wonderfully, but bore very little fruit. The other kinds in the plot were free from fungus. The following spring the trees received two applications of the sulphite, one before and the other soon after the trees were in leaf, and then we waited about five weeks, when the fungus was developing on part of the pears and some of the leaves. The pear trees forthwith received a spraying with the sulphite, and another in a few days. We could not discover any further development of the fungus. The Flemish Beauty pears were a fair crop of saleable fruit, while the Bartletts were an overfilled crop of fair fruit, very many of the trees requiring props all around them. The past season the sulphite was applied, and the pear trees were nearly free from fungus, but most of the fruit was destroyed with the May frost.

Plot 4 contains ten acres of clay loam, and is located south of the ridge. It is sheltered from the north by an orchard of large apple trees, and on the other three sides by a wind break of Northern Spy apple trees set one rod apart. Eight years ago last spring in this field there were planted 1,000 Bartlett pear trees. About 600 of these were very promising, 160 are dead from several causes. Possibly 200 were black-hearted and had vigorous roots. Most of them had sprouts to grow just above where they were grafted, but some only below, and from these sprouts, by cutting all of the diseased trunk off, we have fine, healthy trees.

The pear trees are pruned lightly each year, and the bark slit down the trunk with a sharp knife. They receive a mulching every spring with coarse, barn-yard manure, and, in the fall, a liberal dressing with unleached ashes. The fruit is thinned out with a pair of sheep shears. The older orchards are summer fallowed, and the younger ones tilled for a hoed crop. The plowing around the trees is done with a one-horse reversible beam plow.

A MEMBER.—Are your orchards standards?

Mr. McMICHAEL.—These are all standards; I have had no luck with dwarfs.

A MEMBER.—How far apart do you plant them?

Mr. McMICHAEL.—Those in the plot of 154 trees were seventeen feet, and in the plot of 1,000 trees twenty feet apart each way. For five years we did not have any fine specimens on the Flemish Beauty.

The MEMBER.—Have you tried spraying with Paris green?

Mr. McMICHAEL.—This past season I mixed hypo-sulphite of soda and Paris green, and I ~~intended~~ to have a double effect upon the leaves. I would not compound the mix of the two together. Two or three years ago I had the sulphite mixed up in a large

kettle, but did not get it all thoroughly mixed. If it is a little strong it has the same effect upon the trees that Paris green has.

Mr. PATTERSON (Grimsby).—I have used hypo-sulphite of soda and Paris green together on apple trees, and found no ill-effects whatever from the mixture; but I never use them on pear trees. With me the use of Paris green on pear trees seems to prevent the knotty, gnarled specimens almost entirely. Of course Paris green has no effect at all on the fungus.

THE QUESTION DRAWER.

When the Association met in the afternoon

The PRESIDENT said.—I have here a telegram from the Hon. Mr. Drury, stating that he is unable to leave Toronto to-day, to attend our meeting, and expressing his regret.

The following topics were discussed from the question drawer :

PEAR CULTURE AND UNDER-DRAINING.

Q.—On the heavy clay soils of Essex and Kent, which are covered with rich vegetable mould, will the cultivation of pears be successful without under-draining, and if such lands will under-draining pay?

The PRESIDENT.—I should say emphatically yes: underdraining will pay for any kind of fruit.

Mr. WILLARD.—My own experience has led me to believe that all lands on which pears are grown should be under-drained, unless it is naturally under-drained. We find that dwarf pears do better on certain kinds of lands, while standards do better on other kinds, and, from the statement of the case here, I think the land would be admirably adapted for dwarf pear growing if it were sufficiently under-drained. Dwarfs do not want to stand with their feet in water, and although they do not run down a deep root like standards, they like to have it reasonably dry.

A PREVENTIVE FOR MICE AND RABBITS.

Q.—What is the best preventive for mice and rabbits getting at trees?

The SECRETARY.—It seems to me that Mr. Wilson, who asks this question, could have very well answered it, as I heard him say he was the suggester of the wire screen protector for trees.

Mr. WILSON.—In our part of the country (Chatham) we have a great deal of trouble with mice and rabbits, and I invented the screen which the secretary has referred to, and it is a good thing. It is just the ordinary wire screening rolled on a small broom-stick, and the spring keeps it in place so that it won't slip. It keeps the mice and rabbits away, and can be left on the tree until it is large enough to need no protection. We leave it on from one year to another until the tree grows up. I put out 2,000 apple trees two years ago and put it on them all, and they are all there yet. Buying the wire wholesale it costs, if I remember right, about $2\frac{1}{2}$ or 3 cents per tree.

Mr. RICE (Port Huron).—I tried one little experiment on mice. I had some trees set along a fence row and the mice troubled me; so I got some tar paper and tied it around the tree with a light piece of string, putting it around three or four times. I had doubts whether it would stay on all winter, and I was much surprised to find it became hard, the string came right off, but the paper has remained intact around the trees three years, and they have been perfectly protected. The expense is almost nothing. The tar paper becomes hard and keeps its place and expands with the growth of the tree in the same way as the wire that has been described, and it has proved perfectly effectual for the purpose intended. I had one large tree, six inches in diameter, that was notched by mice. It had been in that condition one year and I tried the experiment on it. I be-ve-

elled off some sprouts that had grown up from the bottom, shoved them under the bark above, and had a load of fresh stable manure packed around the tree quite high. That was four years ago, and this year the tree shows very good health, and has borne quite a crop of apples.

Mr. BEALL.—The most effectual thing I know of is simply this: do not allow a blade of grass or anything of the kind to grow in your orchard, and I will guarantee there will be no mice.

The SECRETARY.—If you get a snowbank there, you will have mice, whether there is grass or not.

Mr. BEALL.—If there were no grass there would be no mice; mice do not breed in the snow.

Mr. F. W. WILSON.—I find the trouble with the tar paper spoken of by our friend Mr. Rice is that it excludes the air, which is very injurious to the tree.

Mr. CASTON (Craighurst).—Mr. Beall is right in saying that if you keep the orchard clean you will have no mice, but no matter how clean you keep the orchard there is always grass around the fence.

Mr. RICE.—In regard to the health of the trees, those I speak of were very unhealthily looking, but they have improved in health each year, and this year they are fine and healthy, after having the paper around them for three years.

SPRAYING TREES WHEN IN BLOOM.

Q.—What can we do to prevent people spraying trees while they are in blossom, and in so doing destroying the bees?

The SECRETARY.—I should suppose that if the opinion of this Association is sent abroad that it is unwise to spray at that time, it would be sufficient.

SEVERAL MEMBERS.—Yes, I should think so.

The SECRETARY.—Then I move this resolution: "Resolved, that it is useless to spray our fruit trees while they are in blossom, and in the interest of bee-keepers this Association hereby unanimously condemns the practice." Carried.

SEASON TO SPRINKLE WITH POISONS.

Q.—What is the proper time to sprinkle fruit trees with poisons?

The SECRETARY.—The proper time is just after the petal of the blossom has fallen; as soon as the fruit has formed. That is the proper time to make the first application of arsenical mixture to the fruit trees. It should be repeated after a heavy rain, because the rain will wash off all the poison. I may here remark, as something has been said about it, that in Grimsby our fruit growers have found that three ounces to fifty gallons of water is a sufficient quantity to use.

COMPARATIVE VALUE OF FERTILISERS FOR ORCHARDS.

Q.—What is the comparative value of fertilisers for orchards?

Prof. PANTON.—I think this question might be better answered by a practical man than by me, who am only a teacher of science and its principles, as far as applicable to plant life. I think, however, that on general principles the potash fertilisers seem to bring about the best results for horticultural purposes. There are certain elements very essential to plant life, and one of them is iron, which is very important to the preparation of the green coloring matter in plants. But there is generally sufficient of that in the soil. This green coloring matter in plants is what enables them to take the gases from the atmosphere, and out of these the properties necessary for plant growth. Another element very essential for that purpose is potash. You may have the green coloring matter present in the plant, but before it can do any work in the way of the preparation

of starch there must be light, and even in the presence of light it can do little or nothing without potash. It is just as if you had a fine factory with all the belts and pulleys and a grand engine in it; but until you got a fire going and steam generated your apparatus would be of no use. So in plant life there is no element which has more influence in working the whole manure than the element of potash; and I would therefore say, on general principles, that potash fertilisers are likely to bring about the best results.

F. W. WILSON.—I agree with the professor both practically and theoretically that ashes is one of the best fertilisers we can get. But just now there never was a business so entirely ruined as the potash business, owing to German mineral taking the place of potash. There is no demand for it, and we should take advantage of the opportunity thus created. There was never a better opportunity for fruit growers than at present. I have engaged two of the largest mills around Chatham to supply it at four cents a bushel, and some of these are producing three or four large waggon loads per week. I would advise you all to try the same plan in your own neighborhoods.

Mr. DEMPSEY.—I do not know of any manure better than bone dust, and if you can dissolve it in sulphuric acid it is all the better. I applied it in that way very liberally, and the result was that the next year I had one of the finest crops of Flemish Beauty I ever had in my life.

Prof. PANTON.—You should add a little super-phosphate.

MILDEW AND OTHER FUNGI.

Q.—Is the Industry gooseberry free from mildew?

The SECRETARY.—With me it has been; with the President it has not.

Mr. BEALL.—There is only one kind that is worse with me.

Q.—Please inform us what causes mildew on grapes, and what will cure the disease also what is the cause of the grape rot and what is the preventive?

The SECRETARY.—The mildew referred to and which is most common in Ontario is a fungus—really a plant. I cannot explain its cause's except to say that it is propagated as other plants are, by very minute spores, which can only be seen with the help of a microscope. As to the cause of the grape rot, it is also similar, a fungus. I believe that a copper sulphate is one of the best preventives for this, or the Bordeaux mixture, applied with a whisk broom in the absence of a proper spraying apparatus.

Q.—Is the statement made that mildew only attacks plants already affected by disease?

Prof. PANTON.—I do not think the statement is made that they attack no other, but there is a tendency to attack that type more than any other class, just the same as a weakly person is more subject to disease such as typhoid fever than a person who is perfectly healthy. That disease is caused by germs, as many diseases of a more or less epidemic nature are now admitted to be. So with fungi, weakness in the vigor of the plant renders it peculiarly liable to attack. I have no doubt it may attack strong plants from time to time, but the tendency is to attack those weakened by disease. All these fungus diseases are caused by germs or spores getting into the plant structure in some way. If the plant is healthy and vigorous it very often goes no further, but if it is weakly it passes right on to its juices and begins to grow. There would therefore be a greater tendency in mildew to attack weakly plants than more vigorous ones.

Q.—Is the statement true of fungi that they are mainly nitrogenous in substance?

Prof. PANTON.—I have never noticed that statement so much as this, that they live on nitrogenous substances—for parasites live on food already prepared. Fungi cannot take up the carbonic acid of the atmosphere and give off the carbon and oxygen; that is the function of the green coloring matter, to elaborate out of it starch ultimately, and the fungi cannot do it. They are parasitic and must be put on the place where the food

is; consequently they are always found in those situations. But I do not think the question is clearly put. All organic matter is more or less nitrogenous, not excepting sugar and starch. If the question was, "Do they live on nitrogenous substances?" I would answer that they invariably do, as far as my knowledge goes.

Q.—Is the practice of manuring with nitrogenous substances good?

Prof. PANTON.—You mean so as to avoid this? Well, I think there might be some specific times when it would not probably be well. It has been ascertained that fields of wheat, where nitrogenous manures have been applied in excess, are more likely to be affected by rust. Why? Because they have brought out too luxuriant a growth, and consequently the cells are more or less in an abnormal condition, which renders them liable to the rust. Now, that is the case with rust. I am not just prepared to say it is the case with other forms, but where there is too luxuriant a growth I think a plant is placed in a position in which it is liable to attacks of parasites, and in that case a person requires to know the nature of the soil. If the soil is already in good heart and likely to bring about a fair condition of plant growth, I do not think it wise to overdose it with nitrogenous manure. I should say too much barnyard manure would not do if the land was in fine condition.

VALUE OF COAL ASHES AS A FERTILISER.

Q.—Has soft coal ashes any virtue, such as oxide of iron?

Prof. PANTON.—I am inclined to say not very much. You will be likely to have enough oxide of iron in your soil. I cannot say what the composition of soft coal ashes is, but as far as hard coal ashes are concerned there is nothing there; all they can do is to open up the soil, and I would think pretty much the same in the case of soft coal. There may be some sulphide of iron, and that may supply some iron, but I do not think there is much in it.

HOW TO BEST PRUNE A COMMERCIAL VINEYARD IN ONTARIO.

The PRESIDENT.—We will now take up the subject of grape pruning, on which Mr. A. McNeill, Science Master of the Windsor High School, who is also an extensive vineyardist, will now address us.

Mr. MCNEILL.—I expect that my remarks will have the effect of eliciting considerable criticism, and I hope to profit by it, as pruning the grape vine is a very serious question with me. I have invested some little cash in the enterprise, and it has now reached such proportions that it is a case of swim or die. I have been led to study the nature of the grape, and to attempt to apply the principles learned to the pruning of it, and I have selected a number of points in grape growth that I think we can apply directly in the pruning. First, we notice that the growth tends to divide itself into many small branches. Allow a grape vine to grow unrestrained, and you will have a number of fine, small branches in the first, second and third year. These branches will not produce fruit for a number of years, and then only very small fruit. Secondly, it has a strong tendency to develop the higher buds; in the natural course of things these higher buds would develop and the lower buds would go undeveloped, although now there is comparatively little difference in their relative strength. Thirdly, other things being equal, the buds are developed neither at the base of the cane nor at the top of it, but mid-way—I am speaking now principally of the Concord. Fourthly, that a sharp bend in the cane has a tendency to develop the bud just above it. Fifthly, the construction of the terminal bud while in the green state has a tendency to hasten the maturity and development of the tissue and buds below it. The effect, however, varies with the distance from the terminal bud. That is to say, if I take this while in the green state there will be a tendency to develop the bud next to it, and a certain tendency to develop the next, with the effect of lessening as we get further from the bend. Sixthly, with a strong growth in one cane rests the growth and developments of the other canes. Now, I have selected out of a number of principles these six, and propose founding whatever system I may present you upon those six principles. (From this point onward

Mr. McNeill's address was so profusely interspersed by illustrations on a trellis on the platform as to render it impossible for the reporter from his notes to give a transcript which could be understood by a reader).

Mr. READ.—The heaviest crop of grapes I ever saw was upon a lot of Niagara vines in the County of Kent, Michigan, and the man who had them pinched off the summer new growth at the second bud, or thereabouts, above the fruit, immediately upon its setting. He practised that throughout his whole vineyard, and the fruit developed largely, and the leaves grew to twice the size of those upon the vine left to grow free. It seems to me that with the Concord it would be equally good.

Mr. MCNEILL.—It is a question of cost.

Mr. READ.—This gentleman has probably got back all the cost in the increased crop of grapes.

BEST MODE OF MARKETING GRAPES.

The PRESIDENT.—Mr. M. Pettit, of Winona, will take up this subject.

Mr. PETTIT.—The best mode of marketing grapes is a rather difficult question to deal with, when considered from the fruit-grower's standpoint, as much depends upon the distance from the market, the requirements of the market, and so on, which must be studied by the growers themselves. Samuel Miller, writing in *Popular Gardening*, says: "The man who shall devise a plan whereby a man shall get what he earns by growing fruit will deserve a monument." I am not a candidate for that monument, but there is a great deal in the remark worthy of consideration by the man who grows fruit for profit. As most of us know, carrying companies and commission men take about one-half the receipts, while the grower has to almost beg for the other half. In none of the products of our soil is the difference between what is paid by the consumer and the amount received by the producer so great as in the case of fruit. This may be partially accounted for by the perishable nature of fruit, and also the channels of trade through which it flows. Care in picking is of great importance with grapes. Pickers who are too careless and lazy to lay grapes in a basket, but drop them in like potatoes, should not be allowed in a vineyard. As a rule women and girls make the best pickers; they handle more carefully, and display more taste in making them look neat. You must please the eye of the buyers, who judge by appearances, and keep your packages neat and clean. For the commission market use the best baskets, and let the color of the box correspond to that of the fruit. In shipping for dessert purposes, let nothing go in the basket but what you would eat yourself, or put on your own table for your friends. Shipping green grapes has cost the grape growers of Ontario thousands of dollars, and has done more to glut the markets than any other cause. Growers, in haste to make money, have allowed their vines to overload. This has caused the fruit to be poor in flavor and late in ripening. Then to secure the early high prices they are picked as soon as fairly colored, which has done more to disgust people with using grapes than all other causes. I venture to say that one-half of the grapes grown in Ontario are picked and marketed before they arrive at the state of perfection. Another cause of overstocked markets is changing from one market to another to try for high prices. Montreal and Toronto are our two largest distributing centres, and when Montreal reports high prices and good demand, shippers send to Montreal. The consequence is that the market there is overstocked, and Toronto being neglected the tide turns there and prices go up and the same thing it repeats. If every grower would ship to his nearest and best market regularly certain quantities every day, they would soon work off at higher prices and give better satisfaction to the consumers, who would receive daily good fresh fruit, and there would be better satisfaction throughout. Another mode of marketing grapes, not always profitable, is consigning them to commission firms or merchants who start business with the spring birds, who distribute large quantities of shipping tags throughout the fruit growing sections and quote better prices than the old established firms.

Q.—What sized baskets are usually used?

Mr. PETTIT.—Ten and twenty pound baskets are used in our locality for the bulk

of our grapes ; twenty pounds is a sixteen quart basket. It is too large, and I think if that basket were entirely done away with it would be much better. A basket such as peaches and plums are shipped in, and which holds sixteen pounds, is fully large enough. The cheaper grapes are usually shipped in the larger baskets.

Q.—Don't you get better returns from small packages than large ones, when they are nicely put up ?

Mr. PETTIT.—A few years ago, when the smaller baskets came into use, I think we did as a rule, but there is very little difference now.

Q.—For early grapes or choice varieties, would not the small packages yield the best returns ?

Mr. PETTIT.—Yes, I think they would.

Q.—What varieties do you find bring the best returns, in shipping ?

Mr. PETTIT.—The Worden, Concord and Rogers No. 4 are what I would plant in our locality for black ; and for red, Delaware, Lindley, Brighton, Agawam, and Catawba in some sections. For white, Niagara stands the season pretty well, and is such an enormous yielder that it is far more profitable than any other white grape.

Q.—How do you find Salem in your section ?

Mr. PETTIT.—It is more liable to mildew than most of the red Rogers, besides, if we get a shower when ripe, they burst badly ; but for winter use I do not think we have a grape in Ontario to beat it.

Q.—Have you tried Amber Queen ?

Mr. PETTIT.—Yes, but not to any extent.

PURE GRAPE WINE FOR HOME USE.

The President announced that Mr. E. Girardot, secretary of the Vine Growers' Association of Sandwich, would answer the question, " What is the simplest way to make a small quantity of pure grape wine for home use ? "

Mr. GIRARDOT.—I believe I have undertaken quite a task in answering this question, for it takes nearly as much time and knowledge to make a small quantity as to make a large quantity. I will explain, however, just as I would to some of my neighbors if they asked me. First, the person making it should know a little of the nature of the grape. Now the grape itself consists of the skin, which holds the coloring matter, and part of the tannin of the grape ; the juicy or watery part, which contains the sugary part of the grape ; and the pulpy part, the fleshy matter, which contains tartaric acid ; and the fourth part or element is the seed, which does not go into the making of wine. It contains a kind of volatile oil which you may call fusil oil, which would be a nuisance in wine if it were crushed when the grapes are crushed to make wine. In some parts of the country here the wine makers prefer to take the stems away from the grapes. This, in my opinion, is not right, because the stem of the grape contains a great amount of tannin, which is the preservative element in wine, and has the effect of making it keep for years, which it would not otherwise do. Of course in order to make a small quantity of wine one should know what amount of grapes to buy. Well, it is generally recognized that from eighteen to twenty pounds of grapes is sufficient to make one gallon of wine. The next thing is a vessel to ferment that wine in, and for this I would recommend a whiskey barrel. Take out the head, and in the bottom put a bundle of straw, and over that straw put a brick well cleaned, and then make a hole and put in a faucet. Next comes the pressing of the grapes. You may take a small vessel and in it put a certain quantity of grapes and crush them enough to break the berry, and then put them in the barrel. Do not fill the barrel completely, because the carbonic acid gas makes the wine rise, and if it is too full it will overflow and you will lose the wine. Generally the vessel should not be filled more than two-thirds ; one-third should be left for fermentation. Now, there is a great question in

making wine that is fit to drink. I believe our grapes here are grown in as great perfection as in any part of Ontario, the climate being very favorable to the maturing of the grape. Generally the juice of our grape contains from 20 to 22 per cent. of saccharine matter; but this has been an exceptional year, and they have contained 25 per cent., which would make a wine very rich in spirit. It is a recognised principle in chemistry that the saccharine part of the grape is converted by fermentation so that twenty parts of sugar would give 12 per cent. of alcohol. We must allow something for the organic matters in wine which do not ferment, and it also loses by evaporation—we cannot get all the alcohol from a given amount of sugar. Generally we can make a natural wine here, if we do not add any sugar, containing not more than 10 per cent., which we find is not quite enough to fit it for shipping purposes. Such a wine would keep very well in a cellar, if not moved, but if it is to be shipped to any distance it will get turbid and is apt to turn sour, and the only corrective for that is to add sugar or spirit to it. It is not good to add spirits, because in this country we cannot obtain wine spirits. The wine spirit is what we call amylic alcohol, and that we cannot obtain here. We can buy grain spirits, but these do not assimilate with wine spirits, and for that reason any wine in which grain spirits have been put cannot be digested very well; the least quantity will inebriate, instead of cheering as wine ought. Therefore we use the sugar, which by fermentation is converted into alcohol, and by a chemical process converts itself into grape sugar, and of course results in the wine alcohol. Now, the question is, What quantity of sugar shall we put in to obtain a given quantity of alcohol? Well, experiment has taught us that one-quarter pound of sugar added to one gallon of mash will give one degree of alcohol. The sugar cannot be added directly, because we would lose a great deal that would get into the skin and the stems, and therefore we have to dissolve it in water. This raises the question of how much water? If we use too much we shall weaken our wine, and therefore we only put just enough to dissolve it. We have found by experiment that one gallon of water to twelve and a half pounds of sugar is the quantity in order to have a wine having the same virtue and the same component parts as the natural grape contains by itself. This water has also a beneficial effect on the wine. Our grapes contain an excess of tartaric acid, although they do not contain more sugar than the grapes in the same latitude in France or Germany, and this excess is corrected by adding water and makes the wine more palatable. The next operation is the fermentation, and the temperature that we should maintain or place the barrel in. It is a wise plan when we put the solution of sugar in it to heat that small quantity of water, so that when we add it to the wine it will not arrest the fermentation which may have already begun. The object, on the contrary, is to hasten fermentation; the quicker the fermentation the better the wine. Long and slow fermentation only produces turbid wine, which is never palatable, whereas quick fermentation produces good wine, which is always clear. The temperature I should recommend in which to ferment wine is about 70°. It is very essential after fermentation has commenced to keep the temperature up. If you should put it in a place where cold air strikes, it will stop the fermentation, and that is injurious to the wine. It is a wise plan to cover the barrel or vessel in which the wine is made, because if that precaution is not taken it is covered with a kind of fungus which may afterwards cause the wine to turn sour, and therefore the wine must be watched from the beginning. Now as to the duration of the fermentation. This should generally last about eight days in our latitude. We know that the wine is fermented when we discover by the taste that it is not sweet any more. When putting the wine in the vessel to place in the cellar you must not bung it right away, because there is a slow fermentation going on for three months afterwards, and if the barrel is tightly bunged it may burst and you would lose the wine. Wine is generally made here in the month of October, and about December we look at it to see how it is getting along. If it is clear you may draw it into another barrel. You must always use clean barrels. Some people use spirit or beer barrels, and I may tell you that there is no liquid so subject to being affected and taking on a taste from the vessel in which it is put as wine. One day a man ordered a gallon of wine from us, and in his jug there was a musty cork. I filled his jug from a barrel where the wine was perfectly good and palatable, but before he

got home the wine in the jug was in such a condition as not to be fit to drink, from the effect of the musty cork. Therefore either a musty barrel, or one that has been in the shed a long time, cannot be used; it is better to buy new barrels. You can never clean a barrel that has a bad taste well enough to make it fit to contain wine. Barrels that have contained whiskey, port wine or native wine are the best; barrels that have contained gin or ginger wine are of no use for wine. I think that is all I have to tell you, and, if you will follow the directions I have given closely, you will be successful.

PLUM CULTURE.

The PRESIDENT.—We have two questions here regarding plum culture, which according to the programme will be answered by our friend, Mr. S. D. Willard, of Geneva, N. Y.

Mr. WILLARD.—The first question of the two on the programme which I have been asked to answer is, What are the six most profitable varieties of plums for Southern Ontario? I may say that I don't think I am the proper person to reply to that question, as I am not a southern Ontario man, but a New Yorker; and I think there are those in this room much better able to answer it. I will, however, answer it from my own standpoint.

The SECRETARY.—I think the climate is very similar.

Mr. WILLARD.—The question of plum culture has lately been attracting a great deal of attention. My attention was first drawn to it twenty years ago, when visiting the Hudson river country, which at that time was really producing more plums than all the rest of the United States put together, and those who were raising them were getting rich. The fruit was exceedingly large, and they had splendid facilities in getting it on boats for the New York market, but their system of culture was wrong. They robbed the land; they sold their hay and straw and put nothing back on the land, and the result was, before they knew it, that they could no longer raise fruit with profit; and the plum business of the Hudson river is now a thing of the past. But seeing their work is what led me to take it up, and during the last twenty years I have done something in the way of raising plums. The plum has multiplied very rapidly; new varieties have been springing up here and there to be tested and tried, and it is a very wide field in which to work. The list I am about to give does not include some I could raise, because I am not sure they would suit you here. Foremost, as the earliest ripening plum, I would put the Bradshaw, which when young is a little tender, but when aged is one of the most hardy and productive market plums we have. I have trees of that variety from which I have netted as high as \$12 or \$14 in a single season, and that is good enough for me. Following the Bradshaw is the Lombard, which is among plums what the Concord is among grapes or the Baldwin among apples. It is a plum which can be raised with less trouble than any other variety, always gives good crops and always has a market value, for it is known everywhere. Then we have another plum called the Gueii, which originated in Lansingburg, N. Y. It is a very hardy and profitable market variety; it takes on a most beautiful bloom, and if only well known will sell well. I have found it one of the most profitable of plums, and it is very productive. In time of ripening it follows the Lombard.

President LYON.—I think it is said to be cureulio-proof, do you stand by that?

Mr. WILLARD.—No; I do not believe that of any plum. Then we have what is known as the Hudson River Purple Egg. That also had its origin on the Hudson river, and was introduced to me by a fruit man who asked me to test it. You will not find anything about it in Mr. Downing's work, for when I sent it to Mr. Downing he said it was a plum he did not recognise. But it is one of the best for market purposes. It is hardy and productive, and sells well on the market. Then we have the plum known as Peter's Yellow Gage, introduced by Mr. Barry of Rochester. All things considered, it is in my opinion the best of all the light-colored class of plums, and yet it is scarcely known; you will not find it in the catalogue of Ellwanger & Barry. It is not one of the

best growers; nurserymen cannot make money out of it as rapidly as out of some others, but all things considered it is the best light plum grown, being extremely hardy and producing a crop of the finest quality every year. Its disadvantage as against La Reine Claude, which is the standard light colored plum, is that it comes in earlier. If it ripened as late as La Reine Claude I would say it was the best of the light colored plums to plant for market, but it comes in earlier. The advantage of La Reine Claude is that it comes in later. I obtained my stock eighteen years ago, and during last season we have topbudded 150 trees to continue it. Then for the sixth there is O'neil's Golden Drop, which ought to be planted. We have had experience sometimes in winter killing, and in picking these varieties I have endeavored to select those which hold their foliage well, because that is a very important point. The Imperial Gage we have dropped, because the tree is tender. Of the light colored ones I do not know one that is more tender than the Imperial Gage, and it is not the equal of La Reine Claude in productiveness. I have omitted La Reine Claude because I do not know whether it would be considered hardy for your section, and yet it is the "king bee" of all the plums. I have had trees that yielded as high as \$20 in a season.

The SECRETARY.—It is perfectly hardy in western Ontario.

Mr. WILLARD.—Yes; but I desire to say that the plum is a capricious fruit. It may be entirely hardy here and not with us, and vice versa. I think that is the experience of anyone who has grown plums largely.

Mr. DEMPSEY.—La Reine Claude is perfectly hardy in part of our county (Hastings) and tender in other parts, but there is nothing better in the form of a plum for canning. I cannot grow it at all, while a man who lives only twenty miles from me succeeds every time.

A MEMBER.—What about the McLaughlin?

Mr. WILLARD.—It originated in the State of Maine and is of very fine quality, but not a profitable market plum. It is almost of the highest quality to eat.

The PRESIDENT.—What have you to say of the Niagara plum?

Mr. WILLARD.—Well, if you plant good Bradshaws I am sure you will get a good list of Niagras. Shipper's Pride is a very good plum a little north of us in the State of New York. It is a very fair plum, but not what we were led to believe. The Jefferson is of the highest quality, but not productive enough for market, being in this respect the same as the Washington. Quackenboss is a very desirable plum, but we find it has a little inclination to shyness in bearing. There are places where it succeeds well; I have seen it very fine on the Hudson river, but there are others which we think more profitable. The Gueii is much more profitable to raise than the Quackenboss.

A MEMBER.—Do you know anything about Glass' Seedling?

Mr. WILLARD.—Only as I have tested it myself. Some of them were sent to me by this Association a good many years ago, and we tested them in a small way. I thought it was so near akin to the Quackenboss that it was not worth while propagating it. Pond's Seedling is a fine plum, but it makes wood slowly, and is not productive enough of dollars and cents. The Victoria is a very fine plum some seasons; then, again, it is liable to over-produce, and the fruit is small and fails to ripen well. The General Hand is a fine plum in appearance, but does not produce enough. The Peach Plum is hardy; one of the most hardy we have. There are six other varieties I would be very glad to mention in connection with the six I have already named as my choice, which I think are valuable. The Prince of Wales is a most beautiful plum, of very fine color and very productive and hardy. It is comparatively new here, though I heard of it years ago in England. Then there is the Stanton, which originated in Albany county, N. Y. If I were to name only one plum for canning I don't know but it would be this one; if it were two years hence I could tell better. We have now over a thousand trees that will be in bearing next year. It is one of the finest to eat, and we have kept the plums for weeks in our cellar sent up when ripe from Albany county. I

think anyone making a test would do well to plant it. Then there is the Field, which ripens a little ahead of the Niagara, and is like it in size and appearance, except that it is a little darker in color. It is a very desirable new sort, and had its origin in Steharie county, N. Y. Then we have the Grand Duke, one of the latest introductions from England, originated by Mr. Rivers, which promises to be the best late plum of dark color that I know of for market. We had the fruit this year for the first time for market, and it brought a dollar a basket in eight pound baskets. Mr. Rivers brought out three plums, the Grand Duke, the Archduke and the Monarch, which in my opinion are going to make their mark in this country. Anyone who saw the exhibition of fruit at Buffalo this fall might have seen the Monarch. It is one of the largest of plums, and bids fair to be very hardy; the tree holds its foliage very well and is very productive. Then there is one of the Japan plums called the Botan.

President LYON.—Are not there several varieties of that name?

Mr. WILLARD.—Yes, there are. That is a sort of general term for a number of those plums sent out from Japan, but having received this one under the name of Botan we raised it as such; we have another under the head of Botan which is a little different. This summer I obtained two others called the Sweet Botan and Burbank's Japan. I had enough to market this year of Ogan, but I saw they were not going to take, and that was sufficient for me.

A MEMBER.—What do you think of Basset's American?

Mr. WILLARD.—I don't think it is worth enough powder to blow it over the fence.

A MEMBER.—What about Munro's Seedling?

Mr. WILLARD.—It is tender with me; we never grew a plum so tender in the nursery row as the Munro.

A MEMBER.—Have you planted *Prunus Simoni*?

Mr. WILLARD.—Yes. It may be hardy and sufficiently productive, and will be sold at fruit stands even if it is not of the first quality. They want it in the cities, though it is not strictly first-class.

THREE BEST PLUMS FOR HOME USE.

Mr. WILLARD.—I see there is another question: "What are the three best plums for home use, early, medium and late? Quality, productiveness and hardiness of tree tree alone to be considered; soil, light sand?" I think I should take the Bradshaw for the first, then Peter's Yellow Gage and the Stanton Seedling as my choice.

A MEMBER.—Does not the Lombard do well on light soil?

Mr. WILLARD.—Yes, I have seen it do remarkably well.

A MEMBER.—In our neighborhood they have adopted what they call the French stock, which does not sucker as much as the standard stock.

Mr. WILLARD.—We use French sometimes because we cannot get any other, but if I were selecting an orchard I would prefer, if possible, to have them worked on the horse plum stock of western New York. But they will all sucker bad enough if you cut the roots; you can plow them to death a good deal easier than kill them any other way. I would advise people who have plums to do their work with cultivators.

Mr. DEMPSEY.—Did you ever try any of Rivers Damsons?

Mr. WILLARD.—Yes, I have the whole list of them now; they are succeeding first rate.

A MEMBER.—How far apart do you plant them?

Mr. WILLARD.—Our plan originally was 16 feet each way, but now we get our rows 16 feet apart and ten feet in the row; you can handle them better, but it wants high culture. I would not advise anyone to do it unless he has the manure.

A MEMBER.—Do you spray your trees for curelio?

Mr. WILLARD.—As I remarked to-day if it were not for *cureulio* I would not raise plums. God put us here to fight something, and we might as well fight these pests as anything else. So far as spraying is concerned, if I were to spray I would use Paris green. We experimented this year with London purple, to our sorrow, for it cost us about \$500 to learn that London purple was better somewhere else than on plum trees, or perhaps any other trees. It is soluble, and no matter how careful you may be you may touch some of the very sensitive plum foliage. We have used Paris green, but I don't want to hold the nozzle all day myself, and I cannot trust men to do it: they fool away their time, and put on so much that they injure the foliage of the trees.

SALOME APPLE AND RUSSIAN APRICOT.

Q.—I would like to know whether the Salome apple is in any way better worth planting than the Baldwin, and also if the Russian apricot is worth planting.

President LYON.—It does not show any fine qualities beyond being hardy. It is hardy enough for central or northern Illinois, but beyond that it has been found to fail. Its quality is not good and is not particularly attractive. It is claimed to be a good producer, and might do very well for a market apple, but there are so many more desirable apples that I question whether it is worth planting at all.

Mr. WILLARD.—I have not the greatest confidence in the Russian apricot although we grow them, but we have to do so in our business; we have to grow what people want and demand. I have very great doubts of its value, and would not recommend it.

SEEDLING FRUITS.

Q.—Should not the Association appoint one competent man as an expert, to examine and report upon all new seedlings fruits in the Province that may be sent to him?

Mr. BEALL.—I think it would be an excellent idea.

Mr. BUCKE.—Anyone who heard the address of Prof. Saunders of last night will remember that he said he would be very glad to receive at the Experimental Farm any new fruits or trees, and I think he is a very competent person.

President LYON.—The trouble with us has been that there are a great many people who will not take the trouble to inform themselves of what is being done, and are always ready and waiting to be imposed on by travelling tree pedlars who will tell them anything.

Mr. DEMPSEY.—I fall in with the idea, and I think no better man than our secretary could be selected, but I think he would like the assistance of Mr. Saunders and some others in some instances. I move that Mr. Woolverton be appointed as one of the committee to receive fruits as suggested.

The PRESIDENT.—Mr. Woolverton has been acting in that capacity, and you have received some of his reports through the *Horticulturist*, and if only one man is appointed I think he is the proper man. It would be well enough, as Mr. Dempsey says, that he should have one or two others associated with him with whom he might confer in special cases.

Mr. DEMPSEY.—I move in addition that Prof. Saunders, the ex-President, Mr. Allan, and the President, Mr. Smith be appointed on the committee. Carried.

RAILWAY FREIGHTS.

The question was asked, "Is it wise to interview the railway companies regarding a special fruit train service, on the ground that the express companies are no longer competent to carry the ever increasing shipments of fruit in a proper manner?"

Mr. T. H. Race said in reply that last summer he had got from the secretary of the Association three baskets of choice peaches, and that when they had arrived they had all been broken into. On complaining to the company, it was stated that this was no unusual occurrence. He then threatened the company with prosecution, and also to

complain through the Fruit Growers' Association to the Legislature, asking for legislation to protect the public from such pilfering. The agent sent the complaint to headquarters. At the same time Mr. Race enquired whether others in the town had similar complaints to make, and found that it was a common occurrence to have fruit packages pilfered on the train. In about two weeks a reply from headquarters came, giving the agent written authority to settle Mr. Race's claim and hush up the matter; but this he was unwilling to do until there was some guarantee of safer transportation.

The following letter, from the Grand Trunk Railway Company, was handed in and read by the Secretary:

As regards cars being specially fitted with shelves for holding the baskets to prevent the fruit being bruised by the baskets when piled on top of each other. This has been done to some extent by the G. T. R. Co., but it takes so long for the cars to return,—say from Montreal—that practically it is impossible to provide enough of such cars, the season being so short, and they cannot be used for other freight on the return journey, it must be apparent the cost to the Railway Co. would be too great, excepting in the case of short distances, such as between the Niagara district and Toronto where the cars can return daily and therefore a few of them can do a large amount of work. The circumstances here are very different, the distances being so great. However this difficulty of damage by bruising has been solved to a great extent by the new style of basket manufactured in Walkerville, as several tiers can be piled on top of each other without injury to the fruit. On behalf of the G. T. R. Co. I may say that the importance of rapid and cheap transit is fully recognised.

THOS. DOW.

The following letter also, from the Grand Trunk Railway Company, was handed in read by the secretary:

In regard to shipping facilities for grapes and small fruits generally so far as the Grand Trunk Railway is concerned: The possibilities of this district for the cultivation of fruits generally have been recognised, and for several years efforts have been made to encourage those engaged in the forwarding of this traffic viz. by allowing cars to go direct to their destination, even when loaded with but a small quantity of fruit, rather than load the same car for several stations. There has been no hesitation in forwarding three tons direct at any time, but even as low as 1,500 lb have been sent. As a rule there is no delay in reaching the larger places in good time, as there is always other freight that can be used to fill up a car. But the difficulty arises with small lots, more especially when for places off the main line. Such consignments are apt to be delayed more or less at junction points, but three days should be the maximum time in transit in any case. We have been able to give quick despatch to Montreal, Toronto, Hamilton, and London shipments, cars going direct, and those interested may rest assured that no effort will be spared to co-operate with shippers in reaching the markets as speedily as possible.

HEDGES FOR SOUTHERN ONTARIO.

The PRESIDENT.—Mr. McNeill will now address us on the subject, "What kind of hedges are best suited for Southern Ontario."

Mr. MCNEILL.—Hedges are of particular interest to fruit men; as you are well aware they serve the purpose of a wind-break and a protection from the inroads of animals and as an ornament. I think those three purposes are served by hedges. I was converted to hedges by a short visit to England, and I think Canada will never be really beautiful until it has its hedgerows. As a matter of protection against animals I am not altogether so sure that they are a success. I am afraid that in the case of cows the unsightly wire fence is ahead of it, and I do not see how it is possible to grow a hedge for less than a wire fence can be constructed for. In the case of the wire fence you have the protection at once, while in the case of the hedge you must wait a number of years, so merely for protection I do not think the hedge is a live question for many years to come. There is another aspect, however, of particular interest to fruit growers—the wind-break; it is conceded that the wind-break is of material advantage to the fruit grower, and it is from that and the aesthetic standpoint that it must stand or fall with them, for on the score of cost it cannot compete with the wire fence. Twenty-five years ago I helped my father to plant a white willow hedge. We took long pieces of willow limbs and dug a narrow trench and put our willow sticks down five or six inches apart, and had no trouble whatever in getting them to grow. My father left that neighborhood a year or two afterwards, but I saw that hedge about five years ago, and it was a perfect solid wall of vegetation, through which a mouse could hardly crawl. But I think it was costly as far as the occupation of ground was concerned, and white willow must pass out of consideration altogether. My father and I experimented with the common thorn.

The special thorn I am speaking of is called the Cockspur thorn, which is more easily described to the ordinary individual as a species having a perfectly smooth leaf and being thickly set with thorns. After several failures in our experiments with this we got both the method of growth and the plant that answered the purpose as a hedge plant. Our error in growing it was in allowing it to grow too high before cutting it off, and as a consequence in one or two years there were bare spaces below, but after we had some experience we found that we must get a strong bottom growth after which there is no difficulty in getting a perfectly impenetrable hedge, and a hedge that will last for ever. The advantages of this thorn are these: First, it is a perfectly hardy plant; you cannot kill it by any ordinary method. It will stand dry weather, cold weather, or wet land to any degree found in land fit for cultivation; it will stand browsing which only improves it, and, in every way, it makes a splendid hedge. Its growth, however, is too slow to satisfy most people, and it has one other fatal defect I am afraid. So far we have always been able to get our supply of the plant from a river bottom flat, but if the plant is ever to become a hedge plant it must be propagated in some other way, and I do not know how it can be cheaply propagated. I was informed by Prof. Saunders that the seeds are exceedingly slow of germination, and if that is the case it is a serious defect, but I think it is worth while to experiment with root cuttings, from which some of the same family are very readily developed. Our experience is simply that we take these plants from a river bottom and plant them out, and in about four years they make a hedge that will turn anything and that gives little or no trouble in the way of trimming or pruning. The hedge in question is so close that nothing can make its way through it, but mice or small birds. The birds make their nests in it, and it is a most excellent protection for them, and if for nothing else I think hedges should be grown for the protection of the birds which are such friends of the fruit grower.

FRUIT AS FOOD.

At the evening session a paper was read by Mr. L. Woolverton, Secretary of the Association, on this subject, as follows:

One of the best ways of increasing the selling price of our fruits is to educate the public into a freer use of them. Fruits are too often looked upon as mere luxuries, agreeable to the taste but useless when nourishing food is required. We find the citizens buying meat and potatoes regularly, but the fruits are only purchased occasionally as a special treat. When the family go from the city to the country in summer, the mother is in constant anxiety about the amount of fruit her children consume, and is surprised when the dreadful results anticipated do not follow. This craving which children have for ripe fruit is one proof of my first point, viz.: (1) The free use of ripe fruits at our meals tends to health and longevity. No doubt there are many persons present who can verify this position from actual experience. I have heard men say that in the autumn, when harvesting grapes and eating freely of the fruit, they have noticed an increase of weight of from five to fifteen pounds. So well acknowledged has the healthfulness of the grape been that, in France and Germany, patients are treated with what is called the "grape cure" for many diseases due to overfeeding. A French physician says that nothing does more to rid him of his patients than the daily use of fruits; and another says that since the apple has been more freely used in Paris, there has been a decrease of dyspepsia and of bilious affections. We all know with what avidity the fevered patient sucks the cooling juice of the ripe cherry. I have in a previous paper, referred to the healthfulness of the currant in dispelling headaches and reinvigorating the system.

Not only on the score of health, but also on that of economy, we can speak a word for the use of fruit. Meat is one of the most expensive articles of diet, and in summer time not the most wholesome. Indeed, some physicians trace autumnal diarrhea to the use of meat in the hot weather, giving rise to alkaloids which are purgative in their effects. The fruit often gets the blame for what is due after all to the meat. A grain and fruit diet, according to an eminent English physician, is in summer more healthful and less expensive than a meat diet.

Fruit contains the elements necessary for the nourishment of the body, as will be seen from the following table showing the composition of the strawberry, viz.:

Water	87	per cent.
Sugar	4	" "
Fibre and	1	" "
Nitrogen	6	" "
Insoluble matter (2 per cent of which is ash)	7	" "

Who objects to being convinced of the healthfulness and economy of the strawberry in summer as contrasted with a meat diet? Prof. Faraday says of apples:

Let every family in autumn lay in from two to ten or more barrels, and it will be to them the most economical investment in the whole range of culinary supplies. A raw mellow apple is digested in an hour and a half, while boiled cabbage requires five hours. The most healthful dessert that can be placed on the table is baked apple. If taken freely at breakfast with coarse bread and without meat or flesh of any kind, it has an admirable effect on the general system, often removing constipation, correcting acidities, and cooling off febrile conditions more effectually than the most approved medicines. If families could be induced to substitute the apple—sound, ripe and luscious—for the pies, cakes, candies and other sweetmeats with which children are too often stuffed, there would be a diminution of doctors' bills, sufficient in a single year to lay up a stock of this delicious fruit for a season's use.

The moral of all this is: Let every farmer plant a fruit garden with such a selection of varieties as will furnish him with a constant succession of fresh fruits for his family, and let every townsman make arrangements for a constant supply of fresh fruit from the fruit market.

The second point I want to emphasize is this: (2) Apples form one of the most valuable articles which can be given horses and cows in connection with their daily allowance of food. In point of nourishment alone they are equally valuable with carrots for horses and with turnips for cows, and more valuable than mangels pound for pound. On page 95 of the Report for 1887 will be found a table prepared by Prof. L. B. Arnold, in which he shows that ripe apples have a feeding value equal to one-third the value of hay, about 16 cents per 100 lbs, or 8 cents a bushel. I believe that this is far too low an estimate and in this I am supported by a Mr. E. H. Hutchinson, an American farmer, who says:

For the general purpose horse of the farmer, I know from actual experience that apples are valuable food. I have had horses that were in very low condition, from worms, entirely freed from this trouble when running among apple trees, where they eat all they want. I believe that a horse not at hard work would do as well on four quarts of oats and a peck of apples as on a peck of oats per day. If this statement is true, it would give apples a feeding value of about 20 cents a bushel.

It will be observed that we have here a practical farmer giving apples about two and a half times the value which Prof. Arnold has allowed to them, viz.: 20 cents per bushel, or 40 cents per 100 lbs. Now if this can be proved it will open up a new way of disposing of a large portion of our apple crop, and increase the value of the farmer's orchard. If apples can be shown to be worth 20 cents a bushel as food for stock, surely we need not fear over-production or market gluts. And if weight of testimony is of any use, here is another from a writer in *Orchard and Garden*. He says:

When some of my pear trees littered the ground with their ripe, mellow fruit, I fed them to my cows. A peck of pears, with two quarts of meal and bran for a noonday feed increased the milk and butter one-fourth, and when the apples were ripe and cheap in the market, the horses, cows, pigs and fowls had all they wanted.

Here are two quotations from the *Michigan Farmer*. Mr. Charles Dann says:

I have fed apples for twenty years quite extensively. During the past three years I have been feeding twelve cows with them. As soon as the apples attain any size and drop from the trees, I have them picked up and thrown in the pasture. Some days the stock get as much as ten bushels and I can always see an increase of milk. The apples are of different varieties, but not very sour. Cut down all trees which produce apples that will not do to eat. I am feeding two bushels of Baldwins at one time to my cows and get an 8 quart can of milk extra from the fruit.

I have been interested in discussing the value of apples for stock. I had last winter 600 bushels of apples and began by feeding them to my team, giving them at noon instead of grain, and with apparent gain to the horses. If the team was hard at work it probably would not answer. I had a pen of fattening hogs to which I had been feeding a bushel of apples for their noon feed. I had no means of making accurate tests, but think they did equally well. I also gave them to my cows, a peck at one feeding, with the result of increasing the yield both of milk and cream. I have also fed them all winter to pigs which I am keeping over. I am convinced that to feed apples to stock is as profitable and much more satisfactory than to sell them to be made into cider with the possibility if not the probability that its use will lead to the use of stronger intoxicants.—E. A. Bradley.

And to accumulate evidence here is a quotation from a writer in the *New York Tribune*:

A few years ago one of our largest apple growers had a large lot of culls left over. He was offered 10 cents a bushel for them delivered to an evaporating and cider-making concern five or six miles away. Instead of selling them at that price he bought hogs to eat them. I am at this time unable to recall the details of his method, but whatever other feed was given them was accurately weighed and measured, and the gross cost at market prices and all other expenses, except the labor of feeding the apples, were duly charged up against the hogs till they were killed and marketed, when it was found that the apples had netted him 32 cents a bushel. The only case of ill result was where a large herd of cows were turned into an orchard of several hundred trees and permitted to gorge themselves without restraint. Like any other food, apples should be fed with much discretion, beginning with small rations and increasing them gradually.

For several years I have myself been experimenting in this direction, and must say that I am more than satisfied with the results. Last winter I fed a team of horses about twenty-five bushels of cull apples which were unfit for shipping. They were fed with cut hay or cornstalks, and chop stuff made of peas and oats; and a part of the time of corn and oats. The ration was made up about as follows: One bushel of cut hay or cornstalks, one peck apples and one quart chop stuff. This was given the team twice a day when idle, and three times a day when at work, with about 8 or 9 lb. of hay at night. The result is that the team came through the winter in a far better condition for work than ever before. There was no need of condition powders with that team. The old coat of hair was shed early in the spring, and the new one was remarkably sleek and smooth; and everyone exclaimed on seeing them, "In what fine condition those horses are." I tried the same diet on a two year old heifer, giving her the same ration twice a day. That beast is now as fine a one as can be seen for miles around, fat and sleek and healthy. I have therefore given up growing turnips and carrots for stock, for I find in my waste apples food as valuable for their nutritious qualities as roots, and more valuable for their condimental qualities.

Having, then, such numerous ways of disposing of our fruit crops the encouragement becomes greater for growing them. We can evaporate or feed to stock all second grade apples and pears, and thus relieve our markets of a class of apples which glut them with rubbish, and anger the busy housewife. Thus also we shall be able to cull closer our fruit for shipping, and only put up for export the choicest grades, which will bring the very highest prices; and secure for our Canadian apples the reputation which their excellence deserves of the very finest in the world.

Prof. J. H. PANTON, of the Ontario Agricultural College, Guelph, then gave his lecture on "Fertilisation of Plants," a most interesting and valuable address, illustrated by a chart of colored engravings. This has been published in the Report for 1888.

The evening was enlivened by some excellent music, contributed at intervals by the Detroit Medical College Glee Club, together with solos from Messrs. A. D. Bowlby and W. Paterson.

Resolutions of appreciation of the kind and courteous treatment by the town of Windsor, of thanks to the press, and to the Glee Club were most heartily passed by the Association,

The Mayor of Windsor, and others, replied in suitable terms, and the meeting was closed with "God Save the Queen."

THE SUMMER MEETING.

The summer meeting was held in the Town Hall, Old Niagara, on Tuesday evening, July 8th and Wednesday, July 9th, 1890.

The President, A. M. Smith, Esq., called the meeting to order at 8 o'clock on Tuesday evening, when an address of welcome was read by Mr. R. Courneen, President of the Niagara Fruit Growers' Association.

The President replied to the address in fitting terms, and declared the meeting open for discussion, suggesting that the Venerable Archdeacon McMurray, of Niagara, should address the audience.

INTRODUCTORY DISCUSSION.

Archdeacon McMurray.—I was very much delighted when I heard that the present meeting of the Fruit Grower's Association was to be held in this town, having long thought that one of its meetings ought to be held here. I have very carefully followed the various meetings of the Association in different parts of the province by means of its publications, of which I am a constant reader, and which I think should be taken and read by every person at all interested in the growing of fruit or in horticulture. I am delighted that you should have met here, and anything I can do or say in furtherance of your objects I shall do most cheerfully. A most interesting paper was recently read before the society here by Mr. Billups, on the curculio, of which he exhibited numerous specimens. I should like to hear that paper repeated during the course of the present meeting. The curculio is an enemy we have to strive manfully against and I am afraid will attack our peaches as well as plums. I think we may learn something practical during this meeting regarding gooseberries. I have some fine gooseberries, but almost all mildew as the trees get older, and the only thing I can see to do is to keep plantations coming on. After a tree is six or seven years old it is almost certain to mildew.

GOOSEBERRY MILDEW AND APPLE SPOT.

The SECRETARY.—Regarding the gooseberry mildew to which the Ven. Archdeacon has referred, I may say that I have been studying very carefully the reports of the United States Experimental Stations, at which a series of careful experiments have been in progress connected with mildew and other fungoid diseases, and I believe that means will be found of stopping mildew without having recourse to cutting down the bushes or destroying them. Experiments are being made with copper solutions, which are found successful in combatting fungi, and one of them, which is being very successfully applied to apple spot, I hope may also prove useful for mildew, that is the ammoniacal carbonate of copper. It is prepared in this way: an ounce of copper carbonate precipitate is dissolved in a quart of ammonia and diluted with twenty-five gallons of water. I think we should keep careful track of these remedies and try them ourselves. I am this year trying this ammoniacal solution of carbonate of copper for apple spot and I think I observe some benefit from it already, although I did not begin so early in the season as I ought to have done. It should be applied before the buds open at all for apple scab, and also, of course very early for mildew, because these fungi live through the winter in some way and the action of these copper solutions is preventive rather than curative. The reason I did not apply it as early as would have been desirable was that our local druggist did not keep it in stock, it being an article not in demand at present and it was not until after a good deal of urging that he wrote to a wholesale druggist and succeeded in procuring it.

Mr. BUCKE.—That is for the apple spot.

The SECRETARY.—Yes. Hypo-sulphite of soda has been recommended and has been used by some with success, but it is not nearly so effective as this carbonate of copper. The only difficulty with the carbonate of copper is that the ammonia renders it soluble, and we have to spray our trees with Paris green as well, which makes extra work. If some way could be devised of using the copper carbonate and Paris green together it would save labor, but unless the ammonia can be dispensed with it cannot be done, because it makes the Paris green too injurious to the foliage.

Mr. CRAIG.—At the Experimental Farm some work was tried in the same line with the Paris green and the carbonate of copper without ammonia to see if there was any beneficial effect, and with carbonate of copper alone and in suspension. I find that in water it will remain in suspension as well as Paris green, so it is possible it may be used without ammonia as a solvent. If, as the secretary has suggested, we can get a combined insecticide and fungicide, it will be a very valuable acquisition. The carbonate of copper costs about sixty cents per pound in the precipitated form. Large trees will take from one to three gallons to do them fairly, that is of the mixture with Paris green.

Mr. BUCKE.—That amount of the stuff would make a very large quantity of the mixture.

Mr. CRAIG.—Yes. We have used a different strength from that mentioned by Mr. Woolverton; I have used it from one to three ounces and at the rate of twenty-two gallons. I do not think there is any doubt we will be able to get some results which can be followed up next year.

The SECRETARY.—As this is an interesting topic I do not think it out of place to follow it up. I would like to add that I have been applying it to the pear as well. This year the Flemish Beautys are horrible, covered with scabs and curling up in every shape on the side in which the seab has affected them and are certainly going to be utterly worthless. Of course it was too late with them; I could not get it in time to apply early enough, but I really think I see some results from its application after the seab made its appearance. I have tried it on pear trees standing side by side, applying it to one and not touching the next and I think I can see a difference. I have not tried the sulphate of copper alone.

Mr. CRAIG.—I was very much surprised to find that applied in the proportions given at Washington it injured the leaves.

Archdeacon McMURRAY.—Would it not be well also to give us the proportions in which Paris green and other chemicals should be applied.

The SECRETARY.—The quantity of Paris green that it is safe to apply is about three ounces to fifty gallons of water. I think that is quite as strong as we dare use it, and about two ounces of the carbonate of copper to fifty gallons, mixed with the other. If you use the carbonate of copper without the ammonia, it, being a powder, can be used with the Paris green.

Mr. BEALL.—You mean adding one powder to the other with the one quantity of water—fifty gallons?

The SECRETARY.—Yes. The two of them in solution with water. Take a barrel that holds fifty gallons and put in three ounces of Paris green and two ounces of the copper. Even with that strength I have often found that I have injured the foliage, but that, I think, is because I stopped too long at a tree and sprayed it too heavily, for I think too much can be put on in that way.

Mr. A. C. BILLUPS.—What effect has the Paris green upon the leaves?

The SECRETARY.—They look as if burned, and then drop.

Mr. BILLUPS.—Have you noticed that the carbonate of copper has any effect upon the curculio when used without the Paris green?

The SECRETARY.—I do not know whether it would or not, not having experimented in that line.

A MEMBER.—Do you find any difference between the solution made with ammonia and the suspended solution?

The SECRETARY.—I have not experimented long enough to be able to say.

Mr. BEALL.—The rev. gentleman here, spoke of cutting up a large number of bushes: I hope he destroyed them.

Archdeacon McMURRAY.—I destroyed them.

Mr. MORRIS.—It is my opinion that mildew in gooseberries is caused by cold nights and warm days. This season we have been comparatively free from cold nights, which, I think has had a good deal to do with it.

Mr. BEALL.—I may say we had cold nights and hot days similar to other years; there has been only a very slight difference in the maximum temperature of this and other years.

Mr. T. H. RACE (Mitchell).—My theory is, and I will always adhere to it, that nature's methods are more perfect than those of man, and if nature is not obstructed in her operations she generally attains perfection. I attribute my success in gooseberry culture to a free circulation of air, plenty of sunlight and the application of ashes to the soil. I have had no mildew for years, but you will not find another garden in the town in which I live in which there is not mildew. When I say ashes of course I mean hard-wood ashes. I have about 200 bushes of Whitesmith, and I have Crown Bob and Industry, which are my leading varieties, and I defy any man to come into my place and find a single case of mildew. The Whitesmith I have seven years, the Industry four years and the Crown Bob two years. I apply ashes very heavily, which is the only fertiliser I give them. There is just one other thing on which I would like to ask an opinion. Five years ago I had a row of Whitesmith gooseberries, about 30 in a row. I wanted to manure them very heavily and I wheeled out fresh manure from the horse stables and dug it in very heavily about half the length of the row, and the remainder I manured very heavily from the cow stable. A few weeks afterward I noticed a rank, fungous growth on the ground manured from the horse stable and the bushes immediately above that mildewed, while there was no indication of mildew at all on that part manured from the cow stable.

Archdeacon McMURRAY.—What quantity of ashes do you apply?

Mr. RACE.—My Whitesmiths are planted five feet apart in a row, and I started with ashes by putting a pailful of ashes between every two bushes. That was a pretty heavy application but I saw good results from it, and every year after I applied about half that quantity.

Mr. MORDEN.—My theory is that the fresh horse manure injured the roots of the plants spoken of by Mr. Race and therefore the fungus could take effect the more readily upon them. Manure from a horse stable, applied in large quantities, will injure almost any tree or plant except corn, which will stand a good quantity. As an illustration of this, I put a hot-bed within ten feet of a large black cherry tree, at least ten inches in diameter and it was within twenty feet of a mountain ash and that hot-bed killed them both. I have wheeled out stable manure and laid it on an open space where some gooseberry bushes got broken down and I found that the bushes on each side were materially injured by nothing else than the heating of the manure.

Mr. RACE.—The condition that induces mildew is in the plant?

Mr. MORDEN.—Yes. I believe a healthy plant has a greater resisting power than a feeble one.

Archdeacon McMURRAY.—I thought the condition which induced mildew was a humid atmosphere.

Mr. MORDEN.—Yes; but what I mean is this, that a healthy plant has greater powers of resistance; it will not be attacked so quickly nor to the same extent as a sickly plant would be. A plant in which a rank and rapid growth is induced is not in a healthy state.

Mr. RACE.—I think the horse manure produces mildew by a condition in the atmosphere arising from gases of some kind.

Mr. MORRIS.—I think Mr. Morden is right, and that too much manure will induce an unhealthy growth; but ashes, on the other hand, while it produces a strong growth produces healthy wood. I have had a good deal of experience in the use of ashes and I think their use makes a strong, healthy bush, able to withstand the attacks of mildew. I know that a pear tree with ashes is not nearly so liable to blight as one with manure.

Mr. BUCKE.—I think if Mr. Race had applied the manure in a rotten state the result would have been different. I have never yet succeeded in killing gooseberries with old, rotten manure.

THE CURCULIO.

Archdeacon McMURRAY.—Regarding the curculio, I was very anxious to know how long it would remain after the fruit falls from the tree, how long it would be before the young curculio makes its appearance. I asked the question and was told not more than four or five days. I had no idea it would come out so quickly as that; I thought a fortnight or three weeks.

Mr. BILLUPS.—In reference to the curculio leaving plums, I find that under various circumstances they leave at different times. I have noticed that in mild, warm, still days the plum does not generally fall until relieved. In that case the curculio leaves sooner than if the plum had been blown off by a storm, in which case it remains for some time. I would like to know if anyone who has studied the matter can tell definitely the average time the larva takes, after the plum has fallen, before it enters the ground.

The SECRETARY.—I do not think anyone present can answer that.

Mr. BILLUPS.—I think it is one of the few things Prof. Saunders has failed to mention. I think if farmers would only take the trouble to gather the fallen plums at intervals of two or three days and destroying them it would do much good not only with plums but with cherries. I have found in several instances this summer that over 90 per cent. of the cherries have been bitten by the curculio.

The SECRETARY.—I have been experimenting with hellebore in water and spraying cherry and plum trees, part of them with it and part with Paris green, and I am certain I had better results with the hellebore than with the Paris green, that is from one season's experience. The proportions were the same as we used for the currant worm. The cherry trees upon which I tried it are free from curculio, but unfortunately they are rotting badly.

Mr. BILLUPS.—The use of Paris green is very unsatisfactory indeed. I have never seen any experiments with hellebore, but I do not think it could well be less satisfactory than Paris green. The dose of Paris green people here use is a teaspoonful to five quart pails. I think that it is a very heavy dose, and though, in my experience it has not injured the foliage at all it is not at all satisfactory.

The SECRETARY.—I think one reason is that it is not used early enough.

Mr. BILLUPS.—I may say also that I think it is not applied late enough.

Archdeacon McMURRAY.—Is there any way of reaching the curculio after it has fallen and reached the ground? Would not some alkali thrown around as far as the limbs extend be of some benefit?

Mr. BILLUPS.—I do not think it would have any effect; as so soon as the chrysalis has reached the open in the spring the curculio gives off a perfect insect, ready for work. I do not know that it eats very much; once the curculio comes from the chrysalis its only object in life is to lay its eggs and then it dies. I do not think that any alkaline poison around the ground would have any effect. Indeed I may say I do not know that Paris green itself actually kills the curculio; I think it possibly finds there something unpleasant on the plum and therefore leaves it. I believe that sprinkling with some kind of ashes or sanders would be almost as efficacious as Paris green. I think Paris green acts more as a

mechanical barrier than as a poison. I mean that the curculio reaches the plum and finds it is covered with a rough substance and leaves it. I do not believe it eats the poison and suffers thereby, but I believe it merely leaves the tree.

The SECRETARY.—Do you not think it eats the leaves that are poisoned ?

Mr. BILLUPS. do not think so.

The SECRETARY.—It has been found by confining the curculio in a box that it will eat plum leaves.

Mr. BILLUPS.—I have found the curculio eating paper, sawdust and many other things too ; they are very fond of destroying things.

A MEMBER.—What do you think they feed on ?

Mr. BILLUPS.—I think the curculio has very little need of feeding ; I think all the feeding is done in the larval state. They will live six or eight months without eating.

The MEMBER.—Well, I do not agree with that. Can you account for the numerous holes in the plum leaves ?

Mr. BILLUPS.—I think the insects are trying to find a place to lay their eggs.

Mr. PETTIT.—Have you noticed any difference in different grades of Paris green with regard to its dissolving in water ?

Mr. BILLUPS.—No ; I did not know that Paris green would dissolve at all ; I thought it was merely a suspended solution.

The SECRETARY.—You are correct in that, but perhaps the gentleman may mean that some grades are heavier than others.

A MEMBER.—With some the water will remain clear and with others the water is green. With some grades the particles are large and with others small.

Mr. BILLUPS.—That is because of some glutinous matter in the Paris green which sets together the grains, and that glutinous matter would not be dissolved by cold water, but I do not think that either hot or cold water will give a chemical solution of Paris green.

A MEMBER.—How do you account for potato bugs being poisoned ?

Mr. BILLUPS.—If you notice the leaf of the plum tree or potato you will notice a well defined mark of the Paris green. In a chemical solution it is combined with the water, in a suspensory solution the water evaporates. The only object of mixing Paris green with water is to secure its even distribution over a large area. If it is necessary to have a chemical solution the use of ammonia is requisite.

The PRESIDENT.—We have a gentleman here, Mr. Morden, who knows something of chemistry : perhaps he can tell us something about this matter.

Mr. MORDEN.—It is generally understood that Paris green is not soluble in water. This year I used Paris green for the currant worm for which I had previously applied hellebore. I dissolved the paris green in ammonia and applied it at the rate of a tea-spoonful of Paris green to five gallons of water, just half the strength. I have been in the habit of applying it in the suspended state and I had good result. In the suspended solution it settles in drops on the surface of the leaf, and a considerable portion of the Paris green settles in that particular drop, just as in a pail of water, and it consequently cannot be as effective, because the insect may traverse a considerable portion of the leaf before it reaches that part. I am so much satisfied with the results that next year I am going to apply no hellebore at all, but the ammoniacal solution of Paris green.

Mr. CRAIG.—I fancy the reason you find greater effect from the ammoniacal solution is owing to the fact that more of the Paris green is brought into contact with the leaves than there would be in a suspended solution.

Mr. MORDEN.—Ammonia is one of the best tests of Paris green we have. Pure Paris green will dissolve without sediment, but there is no pure Paris green on the market. I would not object to a small quantity of sediment, but I do not think there should be over one-tenth.

Mr. BUCKE.—How do you mix the two together?

Mr. MORDEN.—I take a little Paris green and pour it in a flat vessel, moistening it with water before putting in the ammonia, because there is sometimes a little mucilaginous matter at the bottom and you can then get a better solution with the ammonia. The solution is a bluish green.

Mr. BEALL.—I intended this spring to have used the ammoniacal solution spoken of for mildew on gooseberry bushes, with which I have been a good deal troubled and had I done so I should have no doubt said it succeeded admirably, because this year I have not had one particle of mildew in any variety; but I made only one very slight application of Paris green. The point I want to make is that we should not jump at conclusions too soon after making an experiment; it is something which requires a long experience and extended observation and the results should be ascertained very carefully and accurately.

THE APPLE SCAB.

The following paper on this subject was afterwards contributed by Mr. D. W. Beadle, of St. Catharines:

Much loss has been sustained by the injuries caused by this fungus to many of our most popular apples, notably to the Snow apple, Northern Spy, Early Harvest, and others. The late John Croil stated that the loss to him was so serious as to amount to thousands of dollars. In former volumes of the Canadian Horticulturist attention was drawn to some experiments made with hypo-sulphite of soda which gave promise of our finding in that fungicide a remedy. Since then experiments have been made with other substances known to possess fungus destroying properties. An account is given in the bulletin of the Agricultural Experiment Station, of the State of Michigan, for April, 1890, of some experiments made there by Mr. L. R. Taft, the horticulturist, the substance of which cannot fail to be deeply interesting to all of our orchardists.

Twelve trees of the Northern Spy were chosen as the subjects of these experiments. The fungicides used were the following: (1) Potassium sulphide, but which of the sulphides is not stated; (2) sodium hyposulphite; (3) a sulphur solution; (4) copper carbonate and ammonia; (5) modified cau celeste, composed of copper sulphate, carbonate of soda and ammonia. Copper sulphate is popularly known as blue vitriol. Two trees each were sprayed with one of these five fungicides, and two were not sprayed at all. The spraying was done with the little climax pump made by the Nixon Nozzle and Machine Co., Drayton, Ohio. Care was taken to cover every leaf and fruit with a fine mist-like spray, using about three gallons to each tree. The time occupied was about ten minutes to a tree, but the report states that with a large Nixon or field pump not over three minutes would be needed for spraying a tree. The applications were first made on the 24th of May, 1889, and the second on June 6th, at which date there was no appearance of scab on the fruit, nor of injury to the foliage from any of the fungicides. On June 12th a third application was made, and at this time there was no appearance of scab or of injury from the use of the chemicals. The fourth spraying was given on the 25th of June, and now the scab was visible on both the fruit and leaves of all the trees, also the leaves of the two trees sprayed with sodium hyposulphite were turning brown at the edges. July 6th the trees were sprayed a fifth time. At this and subsequent applications of the sodium hyposulphite the strength was reduced by the addition of two more gallons of water, and no further injury to the foliage was perceived. A sixth spraying was given July 24th when a slight increase was noticed in the size of the spots, and but very few new scab spots could be found. The seventh and last application was made August 1st, at which time no new spots were forming, and the spots that had formed were not spreading.

There were frequent rains during the period covered by these experiments. Rain fell on May 29th and continued at intervals until June 4th, falling again on the night of June 6th and continuing lightly for the two following days, with frequent showers up to June 25th. There was no rain from that date until the 14th of July, but a steady rain

set in on that day, lasting through the 15th, succeeded by several heavy showers between that and August 1st. All of the solutions except the two containing copper, Nos. 4 and 5, were easily washed off.

Early in October the apples were gathered and assorted into three classes, those entirely free from scab, those slightly, and the badly scabby. The apples in each class were then counted and weighed, with the following result: The trees sprayed with potassium sulphide yielded 1,944 apples free from scab, weighing 441 $\frac{1}{2}$ lb; 5,659 were slightly scabby, weighing 1,171 $\frac{1}{2}$ lb; 15 were badly scabby, weighing 2 lb; that is 25.5 per cent. were free, 74.3 per cent. slightly scabby, and 0.2 per cent. badly scabby. With sodium hypo-sulphite 1,715 were free, weighing 119 $\frac{1}{2}$ lb; 5,484 slightly scabby, weighing 1,218 $\frac{1}{2}$ lb; 65 badly scabby, weighing 10 $\frac{1}{2}$ lb; or 23.6 per cent. free, 75.4 per cent. slightly, and 0.89 per cent. badly scabby. With the sulphur solution 1,010 were free, weighing 278 lb; 4,643 slightly, weighing 1,146 $\frac{1}{2}$ lb; 65 badly scabby, weighing 10 $\frac{1}{2}$ lb; which is 17.6 free, 81.2 slightly, and 1.1 per cent. badly scabby. Copper carbonate with ammonia give 4,289 free, weighing 1,107 $\frac{1}{2}$ lb; 4,067 slightly scabby, weighing 913 $\frac{1}{2}$ lb; 13 badly, weighing 2 lb; which is 51.2 per cent. free, 48.6 slightly, and 0.16 per cent. badly scabby. The two sprayed with modified eau celeste yielded 3,983 free, weighing 1,174 lb; 1,178 slightly, weighing 519 $\frac{1}{2}$ lb; 11 badly, weighing 2 lb; or 68.8 per cent. free, 31.0 per cent. slightly, and 0.2 per cent. badly scabby. A marked difference is seen in the product of the two trees not sprayed, of which only 365 apples, weighing 101 lb were free from scab; 2,498, weighing 681 $\frac{1}{2}$ lb were slightly, and 51, weighing 15 $\frac{1}{2}$ lb were badly scabby; that is, only 12.5 per cent. were clean, 85.7 per cent. were slightly scabby, and 1.8 per cent. badly.

The chemicals used were bought at the drug store in small quantities, costing as follows: Potassium sulphide 40 cents per lb, sodium hypo-sulphite 6 cents, copper carbonate 60 cents, copper sulphate 10 cents, sodium carbonate 5 cents, and ammonia 35 cents a quart. At these prices the cost of five applications per tree, including labor, was for potassium sulphide 20c., sodium hypo-sulphite 12 $\frac{1}{2}$ c., copper carbonate and ammonia 25c., modified eau celeste 30c.

The experimenter is of the opinion that if the spring and early summer should be comparatively dry three applications at intervals of four weeks of either of the copper mixtures will be sufficient. If the spring should be cold and wet five sprayings at intervals of every three weeks will be required. When the trees are sprayed just after the blossoms fall for the codlin moth, the fungicide may be added to the solution of Paris green, thereby saving all extra labor in the first application. When large orchards are to be sprayed the chemicals can be purchased at wholesale, thereby effecting a considerable saving in cost of material.

It will be seen that the copper mixtures are by far the most efficacious, therefore passing the others by, we give the formula for preparing these as recommended by Mr. Taft in his very interesting and valuable report.

Copper carbonate and ammonia. Mix three ounces of copper carbonate with one quart of ammonia, and as soon as all action has ceased dilute with water to twenty-eight gallons.

Modified eau celeste. Dissolve two pounds of copper sulphate in hot water; in another vessel dissolve two pounds and a half of carbonate of soda. When both are fully dissolved mix the solutions together. Before using add a pint and a half of ammonia and then dilute to thirty or thirty-two gallons with water.

It will be noticed that the best results were obtained with this last mentioned mixture, and there seems to be good reason to believe that in the case of varieties subject to the scab fully fifty per cent. will be added to the value of the crop by its use.

I am just in receipt of reply from Prof. Taft. He thinks that the ammonia if added to the Paris green just before using would dissolve the arsenic to only a slight extent. He adds however that he feels like recommending the following formula for the first two applications, viz., dissolve in hot water 2 pounds of sulphate of copper. In another vessel dissolve 2 lb of carbonate of soda; mix in a tub; after all action has ceased dilute to 32 gallons. There would be no danger of dissolving the arsenic by adding this to the Paris green. He believes, however, that the copper solution alone will have sufficient poison-

ing effect to destroy the codlin worm. If that be the case, the Paris green can be omitted altogether. In the last two or three applications he would add the ammonia to the copper and soda as prescribed in the formula given in my paper. (See report 1890). He further says that if this copper mixture is applied early enough and occasionally repeated, it will prevent both mildews of the grape. With reference to the curculio he says, "From what I have seen of the use of hellebore I consider it fully as effectual" as the arsenites.

POINTS IN PEACH GROWING IN THE NIAGARA DISTRICT.

The Secretary, Mr. L. Woolverton, of Grimsby, read the following paper on this subject:

After the good success which has been the fortune of peach growers in this immediate neighborhood of late and the failures which have been our lot in other sections of the Niagara peninsula, it ill becomes a Grimsby man to come here to speak upon this subject. I will not inflict upon you a lengthy paper but only mention a few points which may lead on to a discussion of this subject.

After some twenty years of experience in peach growing, during which time the failures far outnumber the successes, I am still of the opinion that it pays us in this region to grow peaches for profit. Even if we only get one good crop in five years, and that is no worse than our luck sometimes has been, the peach is still worthy of a place on our fruit farms. A good yield will sometimes pay the owner as much as \$200 per acre, and this gives an average of \$40 per acre for five years, supposing he is that unfortunate, while at the same time he is supported by the chance of better things.

Careful attention to a few points will go a good way toward making peach growing profitable. One is, of course a wise selection of varieties. Our president recommended, at our last winter meeting, the following as his choice of six for profit: Alexander, Early Rivers, Hales, Crawford's Early, Wager, Bowslaugh's Late. These are excellent; but I am becoming more and more discouraged with the Early Crawford. This season, for instance, when I have a fair show of others in the orchard there are no Crawfords. Last year it was the same, and indeed this so often happens that it has become almost the rule. Now when we get this peach it is so fine that we feel as if we wanted to grow no other, but we do not get it and we must choose between no fruit or fruit of a less desirable quality. Our American friends, at the last meeting of the N. Y. State Horticultural Society, stated that two varieties lately tested by them had been found to be reliable bearers, viz.: Hynes' Surprise, and Ilorton Rivers. The latter is a seedling of the Early Rivers and possesses many of the excellencies of that very desirable variety. We have also some seedlings of Canadian origin which seem to promise well; as, for instance, one originating at Chatham, with a Mr. Scott, one at St. Catharines with our president, and the one mentioned above, which originated at Grimsby with Mr. Bowslaugh.

I have tried many other kinds besides the above mentioned but nearly all have some fault. I will mention among them the following, viz.: Early Purple, Early York, Royal George, Sweet Water, Honest John, Early Barnard, Early Beatrice, Early Louise, Oldmixon, Jacques Rareripe, Late Crawford, Morris White, Lemon Cling and Smock.

In addition to these, I have now under testing, among others, the following: Troth's Early, Christiana, Salway, Steven's Rareripe, Wheatland, Willet's, Conkling, Cooleedge's Favorite, Foster, Hill's Chili, Lord Palmerston, May's Choice, Mountain Rose, Richmond, Salway, Schumaker, Pineapple, Globe and Centennial.

While I hope that of these latter I may find some of sufficient value to be placed on a list of the six best kinds when I report next to you, I am loth to leave out one or two in the former list, as e.g. the Oldmixon, one of the grandest old varieties, both in quality and appearance that I have cultivated; but it is tender, and worse than all it seems to be peculiarly subject to the yellows. The Smock, too, is a variety that I have highly valued as a late variety, but I believe its place will be better supplied by the Steven's Rareripe.

Another very important point in peach growing is the selection of a suitable site.

and congenial soil, for the peach is very hard to please in this respect. It demands, for best results, a well drained sand loam or gravelly soil. I have tried orchards on sand, clay loam, sandy loam, both high and low, but my best orchard is on an elevated piece of ground of about five acres in extent. On other parts the trees have been short-lived and unsatisfactory, especially on the clay loam.

I am in favor of rather close planting of the peach trees on account of their liability to die of yellows at an early age. If our trees lived, now as they did in the days of our fathers, when it was not uncommon to meet with orchards twenty-five or thirty years planted, then a distance of twenty feet would be needed; but as it is I am inclined to plant at about twelve feet apart.

The method of pruning has much to do with deciding the distance of planting. If the limbs are allowed to grow to any length, spreading out like bare poles, with foliage and fruit far out towards the ends, certainly close planting would not answer. But this method of pruning is out of date in Canada, even trees so treated die early, and are not so productive as when properly shortened in. Of late years I have become more and more convinced of the great importance of the shortening in system of pruning the peach tree, and every year practice it to a greater extent. The idea is simply to cut back the new growth about one-half every spring; and in case of neglected orchards which have already become straggling, to cut back the old wood severely; and in this way an abundant supply of young wood is kept up which is productive of better fruit and a greater abundance of it. An orchard so treated will also live longer and be more attractive in appearance.

The peach orchard must have thorough cultivation, especially in the early part of the season. I usually plow twice in the early part of the season, and then cease cultivation, in order that the wood may mature well before the cold weather.

The peach has its share of enemies and diseases, chief among which are the curl, the culeulio, the borer and the yellows. For the curl I know of no remedy. It is not often severe, but sometimes with the diseased leaves the fruit also drops. I have little difficulty with the borer. I always heap up my trees with earth in the spring and when Mr. Egeria exitiosa, as the entomologists call him, attempts to get a place in the tender part at the collar of the tree he finds he is blocked out by the earth. The Yellows is still as great a mystery as ever, notwithstanding the enormous expense incurred by the Department of Agriculture of the U. S. in trying to understand it. I have looked carefully through the report on the subject faithfully and elaborately prepared by Prof. Erwin Smith, but can find no better method of eradicating this scourge than the one which you and I have been faithfully employing for years past, and that is, rooting out every case as soon as discovered.

Prof. Burrill, of Champagne, Ill., the discoverer of the microbes which cause the pear to blight, called on me last year. He showed me through his powerful microscope the microbe accompanying the yellows, but he said that its mode of operation was still a mystery, and he could not yet say whether it was the cause of the disease or an accompaniment of the unhealthy conditions.

Packages and packing are important in the handling of a crop. The old bushel crate has entirely passed out of use with us in Canada. The half bushel and basket has given place to a twelve quart basket, and now the question is whether this is not too large. I intend to use, for choice samples during the growing season, the ten-pound grape basket, putting only the finest in this package and the ordinary in a larger package; but I shall weary you, gentlemen, if I go into details in matters concerning which you have as much experience as I have.

I only hope that the difficulties in respect to hardy varieties of merit and of insect enemies and fungus diseases may be so far overcome that peach culture in this favored peninsula may take the place it should among our most profitable industries.

Archdeacon McMURRAY.—Are you troubled any with borers? A number of years ago I planted seventy trees from Ohio, and those worms destroyed all my trees.

The SECRETARY.—I have been troubled with them, but not so much of late. I presume that the trees you got from Ohio had the borers in them, and as you did not notice them and did not get them out they destroyed the trees. If the borer is in the orchard the only way is to go with a knife, and wherever you see any castings or wax oozing from the root you may be sure there is a borer, and by removing a little earth you will soon find a hollow place in the bark, and can easily find the larva of this borer and destroy it. This should be done every summer. But I have been very successful with the method I have described in the paper; that is, by going over my peach orchard early in June and heaping up the trees with earth. It takes very little time and where the orchard has been plowed up it is very little trouble to heap a mound of earth around every tree, and that will effectually keep out the borer, because the moth deposits the egg at the collar of the tree. If it deposits it higher the bark is too dry and it is not likely the borer will hatch out, and if it does it will not do any great mischief. I leave these mounds there during the summer; the moth deposits its eggs during June, July and August, and it is during those months the protection is needed.

Mr. NICHOL.—Is that a distinct insect from the apple borer?

The SECRETARY.—Yes. The peach borer, I believe, will live sometimes two years, but generally only one; it will remain in the tree from one to two years before it transforms into a chrysalis. The parent of a peach borer is a moth; the apple tree borer is a beetle.

Mr. MORRIS.—I quite agree with the paper read by the secretary, with the exception of what he says as to varieties. I do not think he has mentioned the most profitable ones at all, that is Wager and Mountain Rose. I agree with him as far as the Early Crawfords are concerned. I have planted five thousand of them in my time, but would not now plant another. I do not think, as the secretary has said, that too much can be said in favor of early cultivation; the only orchards having any fruit this year, that I have seen, are those which have been early cultivated.

Mr. SERVICE.—Which is the most successful, the yellow or the white?

The SECRETARY.—I think, as a rule, I have got more fruit from the white fleshed, but with the exception of one variety, the Wager, I have not tried it sufficiently long to say much about it. Last year it was a most abundant bearer.

Mr. NICHOL.—I have found coal ashes very valuable, not only for the borer; it is an excellent mulch for young fruit trees, and is a protection against drouth and mice. I have applied it heavily, and although there is no fertilising matter in it I have seen no bad effects from it.

Mr. MORRIS.—I would ask the secretary if he does not think trees with long trunks are more subject to disease and borers than short stemmed ones?

The SECRETARY.—I do not know whether it has any effect as far as the borer is concerned, but I am strongly in favor of low-headed peach trees and keeping them down pretty low. I believe in low trees in the first place, and I keep them down afterwards by constantly cutting them back. I think a very great mistake is made in the method of pruning peach trees all through this section of the country. It is not only the trunk, but all the limbs from the trunk are bare for so many feet; you have just tufts of branches away out at the ends of these limbs, and as a result there is very little new growth from such pruning, and the trees very soon die of old age. I know that is the great fault of the growers at Grimsby. I do not think the trees are so productive as when kept down. The object of the borer, of course, is to get into the root, and as long as we have heap of earth or anything to prevent his finding his way to the root of the tree I do not think it would much matter about the height of the tree.

Mr. BILLUPS.—Do you think the mound of earth prevents them?

The SECRETARY.—It prevents their reaching the spot they want to get to.

Mr BILLUPS.—Don't you think it has often an opposite effect—that it harbors them?

The SECRETARY.—You must be careful to take out any borers before you put the earth around about the trees. If they have been exposed during the season the borer ought to be dug out in the autumn or early spring and the trees then banked up and left so during June, July and August, when the moth is flying around seeking a place to deposit its eggs.

A MEMBER.—How do you cultivate low-headed trees?

The SECRETARY.—I manage to get quite near them. I suppose the trunk will be two and a half or three feet from the ground, and then by keeping them well cut back the branches get bushy and you can get pretty close to them, especially if your harness is adapted for the work.

Mr. BILLUPS.—Is it an established fact that the moth of the borer places the eggs upon the stem of the tree or in the earth surrounding the tree. In the little experience I have had I have generally found the borer a little below the surface of the ground. The moth certainly cannot find its way under the ground to deposit its eggs.

The SECRETARY.—I think, though I won't say positively, that it is deposited in the tender bark near the surface of the earth, where the root begins, but I have noticed that when the larva becomes full grown it emerges from the tree and transforms in the castings outside.

FRUIT CULTURE IN THE NIAGARA DISTRICT.

The PRESIDENT.—I find on the programme for discussion the following question: "Is fruit culture on the increase or the decrease in the Niagara District, and is fruit growing more profitable than grain and root crops, taking into consideration the large amount of labor, attention and fertilisers required for the fruit crop, the insect enemies, off years of bearing, etc?"

Mr. COURNEEN.—There is no doubt that fruit culture is on the increase.

Mr. BALL.—Last year there was more fruit shipped from the township of Niagara than from the next two counties to it.

Archdeacon McMURRAY.—There have been tens of thousand of peach trees put out this spring within three or four miles of this place.

The PRESIDENT.—The fact that it is on the increase may be taken as an indication that it is more profitable, but the question is whether it is more profitable when the amount of labor expended and the losses of one kind or other are taken into consideration.

Mr. BALL.—A few years ago all you could get for land here was \$50 per acre, but now no person would think of asking less than \$100 per acre or over for land suited for fruit culture.

Mr. MORRIS.—The planting of fruit is very much on the increase every year.

Mr. NELLES.—I think it pays. We have a very fair crop every year. This is the first year we have missed having an average crop, and this spring we felt sure of having an immense crop.

The SECRETARY.—What do you reckon is the average profit of an acre of peaches?

Mr. NELLES.—I have not figured it down that fine.

Mr. MORRIS.—We have an orchard of four acres of peaches, all the varieties we can get hold of, and one year we had \$1,500 off that four acres. If the peaches had all been of one profitable variety we would have made three times as much as that, for many of the varieties did not pay anything at all. That orchard is about five years old. It is true that it has not since produced anything so good, but I think this year it is going to do fully as well.

Archdeacon McMURRAY.—I am told that \$1,500 off four acres, clearing \$1,200 profit, is what Mr. Carnochan did. I myself had one tree from which we took eighteen baskets, besides four that were destroyed.

The SECRETARY.—I think we ought also to look at the other side. I have planted several orchards, from some of which I have never had a crop; that is the reverse of the shield. My cousin, on the next farm, certainly did reap one enormous crop from ten acres of peaches, from which he got \$3,000, but he never got another like it; I think it was the first and the last real good crop. I do not think, on the average, peach culture pays any better than any other kind of fruit growing. I think it is hardly wise to let these glowing statements go out without some little qualification.

THE SUITABILITY OF ORNAMENTAL TREES.

At the opening of the meeting on Wednesday morning Mr. D. Nichol, of Cataraqui, read the following paper:

In the eastern and northern parts of Ontario there are annually expended thousands of dollars for ornamental as well as for fruit trees, which to the purchaser are worthless. I think most of you are quite familiar with this fact. No doubt this subject has often been discussed at previous meetings of this kind, but still the evil continues increasingly. Travelling tree agents, as a class, are not men of practical experience, consequently they cannot be supposed to possess a correct knowledge of the requirements of the dwellers in the various localities. In this locality you can grow many trees which cannot be successfully grown in by far the greater part of Ontario. Each succeeding generation of farmers in the colder districts goes through the same expensive experience, and the probability is that so long as only about one in fifty read a horticultural or an agricultural journal, so long will they continue to be imposed upon, unless some means can be devised for preventing the imposition.

I do not pretend to have discovered a remedy, but would merely enunciate some ideas gleaned from observation and a long practical experience which may lead to a discussion that may perchance be profitable to some.

According to the programme I am also to speak of some mistakes which are made concerning ornamental trees. I will not undertake to tell you all the mistakes I have made myself because some mistakes I have made in this matter were so stupid I would be ashamed to tell you of them; so I will briefly notice only a few things, without using any technical names.

Although the catalpa, tulip-tree, Kentucky coffee-tree, the magnolias, the cypress, ailanthus, laburnum, enonymus, buttonwood, persimmon and sassafras are not suitable for our northern climate, there is certainly no lack of variety of beautiful trees which can be relied on as being hardy enough and in every way suitable for any inhabited part of Ontario. Among evergreens we have the hemlock spruce, which for gracefulness of habit and richness in color of foliage is not excelled by any foreign variety that I know of. I often wonder why it is so seldom planted and grown as an ornamental tree. Perhaps by some it may be considered too common, but that is a mistake, for, according to present indications, it will soon become one of the most uncommon trees in this country. We have also the Norway spruce, the black, white and blue spruce, the balsam fir, arborvitae in great variety, red cedar and the retinispura, the Austrian pine, Scotch pine, Weymouth pine and a lot of other pines, which, when grown as single specimens with plenty of room make beautiful ornamental trees. Then among deciduous trees, besides all the glorious maples, elms, ashes and mountain ashes, we have the basswood, European larch, European white birch, American canoe birch, purple birch and the cut-leaved weeping birch. Trees of all these kinds, when properly grown as single specimens, are admirable.

One prevailing error in regard to this matter is planting trees too closely together wherever they are planted. Not long ago I saw growing on a lawn in front of a house three beautiful trees of considerable size; one each of the purple beech, cut-leaf maple

and weeping birch. They were only twelve feet apart and beginning to crowd each other, consequently in about three more years the two outer ones will be lop sided and the middle one a spindling scrub. I have seen thousands of fine trees ruined in the same way. Indeed it is only in rare instances they are given sufficient room to display their natural beauty. I speak only of ornamental trees and will not encroach on forestry, at least, on this occasion.

Another objectionable practice is that of clipping or trimming evergreen trees into various fanciful shapes. When trees are grown for ornament and given plenty of room they usually take a natural and graceful form, which is always more pleasing to those who have acquired a correct taste than any distortion that may be given by pruning. I have known some otherwise beautiful landscapes sadly marred by the stiff appearance of some barbered trees.

Another common mistake is made in giving preference to all foreign species belonging to the same genera as some of our native trees. The European larch is of more graceful habit than our native tamarack, and the white birch, with its weeping varieties, is certainly more beautiful than any of our common birches; but the European linden is not by any means preferable to our basswood as an ornamental tree, neither is the English elm for beauty or for shade to be compared with some of the varieties of our own white elm. Particularly is this noticeable on some of the streets in Toronto where the different species are growing on opposite sides of the street. The horse chestnut is a magnificent tree when grown to perfection, but in my district it is too short-lived; even if it lives for 30 or 40 years it loses its beauty when branches begin to die.

There is perhaps no tree more unsuitable for ornamentation than the silver poplar, (Chinese abele,) yet about many farm houses it is the only tree planted. When once planted it is there to stay, for it continuously sends up suckers enough to destroy every other kind of tree near by. The down it throws off, after flowering, is an abomination. The Lombardy poplar is admired by some, but it deserves no place on ornamental grounds. Whoever will plant poplars let them plant the aspen; it possesses some beauty, but it would be folly to plant it unless for the sake of variety.

When asked which of all trees I prefer for the ornamentation of a lawn I invariably recommend the cut-leaved weeping birch. I have lost many fine specimens of it through the depredations of the sap-sucker, (yellow-bellied woodpecker) yet if I had but room for one ornamental tree I would plant this one. Next I would prefer the purple birch, Weiss' cut-leaved maple, European larch, red cedar, blue spruce and Norway spruce; after that the European mountain ash, the Imperial cut-leaved alder, the basswood and the dogwood. On extensive grounds I would of course plant a large variety and would include the yellow locust. The only objection to it is its tendency to send up suckers. The sweet perfume from its flowers in the month of June entitles it to a place on the pleasure grounds.

The wild black cherry is seldom planted as an ornamental tree although it is remarkably suitable for the purpose. It is beautiful in flower as well as in fruit. I have never seen it affected by the black knot, but have found it to be one of the most enduring.

The hickories, as a class, are of slow growth while young, but their foliage is exceedingly beautiful. In exposed positions they endure and thrive well, while many other kinds would be injured. The ash-leaved maple is quite as hardy but it requires a richer and moister soil. For a large growing, wide spreading tree for shade the common birch is unsurpassed. The white ash, when grown as a single specimen with plenty of room, is a noble tree, well suited for an extensive landscape.

Many others might be added, but I fear I have already occupied too much of your valuable time. I have mentioned nearly all the most beautiful of our native species, at least a sufficient number to make any country home as cheerful and beautiful as the most refined taste could desire. I believe one of the chief reasons why so many farmer's homes look desolate is because the owners have become discouraged through the imposition of unscrupulous vendors who have urged the purchase and planting of trees utterly unsuitable for locality and conditions. Nurserymen who allow their agents to sell unsuitable trees are also blamable and they make a mistake, because success with suitable trees would certainly lead to increased demand. I have been selling trees for 35 years and by selling

some which I only supposed to be suitable have been frequently required to make retribution or be branded as a rogue. It requires an ordinary lifetime for a man to learn by experience the suitability of trees which are not indigenous to this country ; hence the necessity of being guided by the experience of others. If buyers would take the trouble to inform themselves as to what trees are suitable for their locality and order direct from experienced and reliable nurserymen they would obviate disappointment and the provocation of being swindled.

Mr. MORRIS.—I agree with what has been read in the paper. Regarding the pruning of evergreens, I think they can be sometimes benefited by the use of the knife, not distorting or trimming them into fancy shapes, but shortening a limb here and there where it is required. Ironwood can be made into one of the prettiest of ornamental trees that grows, and it will grow so thick a bird can hardly go through it.

The PRESIDENT.—One or two nurserymen in Rochester make a specialty of ironwood, I think, and even advocate it as a hardy plant.

The SECRETARY.—I think it would be well to hear from Mr. Gilchrist, of Toronto, who is somewhat interested in the varieties of trees adapted for planting in southern Ontario for small ornamental grounds.

Mr. GILCHRIST.—The question has been somewhat sprung upon me, as I did not know what was to be the programme until I saw it this morning. I think I can endorse all that Mr. Nichol has said as to pruning ; it is time we had learned to stop it. It may be all right for a man to go to a barber to get shaved, but I do not think the use of the knife improves the appearance of our ornamental trees. Almost everywhere in Toronto it is the same, the natural beauty of the tree is destroyed by pruning. I think we in this society should advocate the leaving of trees in their natural shape and beauty. What is the use of planting a great variety of trees and pruning them all into one shape ? There are two kinds of beauty, the symmetrical and the irregular, and we find the trees having the second character, such as birch or elm, the most admired by refined people. I think the blue spruce is the best spruce. It has proved quite hardy at Guelph ; and when spruces are selected they have the most beautiful colors. Some are as green as the Norway spruce, while others are almost white. It will not stand the knife, which destroys its symmetrical form. There are four or five varieties of the cornus which are very beautiful, both in the fruit and the flower, and the foliage is always beautiful. I think all the cornuses might be utilised, and also the witch-hazel (*Hamamelis*), which has fine large leaves ; it is not a large shrub, but one of the finest we have. But I prefer the American elm to any other tree except the cut-leaved birch. The latter is spoiled by being planted among other trees ; it should be planted alone, where it has room to develop, and so that it can be seen from every aspect. The cut-leaved maple is also a very nice tree, but not superior to the cut-leaved birch. Some European trees have better forms than the American ; for instance, the birch and some others that might be used to advantage, but I quite agree as to the lindens. Our American linden is another very fine tree, as is also the soft maple where it has room to develop. I think it is very much finer than the hard maple. The horse-chestnut has been planted too closely in Toronto. It is a tree which has seen its best days. In the northern part of the country it has never succeeded, and the money spent on it might better have been spent on native trees. It is very disappointing to pay out \$1 per tree for chestnut trees and never have them grow twenty feet high. I know that thousands of dollars have been spent on that tree in the northern part of Ontario. Nurserymen should try to send out trees suitable for the localities they are going to, and should not employ ignorant agents. The time is coming when they will have to be enlightened on these points ; there is no use in planting peaches in Muskoka, and it is just the same with planting horse-chestnut trees.

The SECRETARY.—Are there any other trees planted around Toronto that you think are worthless ?

Mr. GILCHRIST.—The catalpa does pretty well. It kills back when young, but when it gets older it is a straggling, irregular tree. There are one or two in Guelph about

twelve feet high, in sheltered positions. I do not think it is a tree that should be recommended for planting, however. The Association ought to take up the matter, and make out lists of the ornamental trees adapted for different districts. There would be no difficulty at all in doing so, and it would save thousands of dollars to farmers. We have such a variety of climates that a very short distance makes a great difference in trees: those which may do very well here do not do as well in Toronto or Guelph.

Mr. MORRIS.—In regard to pruning, I think most shrubs, if left unpruned, become as unsightly as old currant bushes. Early blooming shrubs can be trimmed immediately after blooming, and the new growth will bloom the following season; I think that is the way they should be treated. Many, like althea, will grow into a good shrub without pruning, and of course I do not think they should be cut. I think Mr. Gilchrist is mistaken when he says that spruce cannot be pruned—

Mr. GILCHRIST.—I think they can be pruned but not improved.

Mr. MORRIS.—I differ from you there, again. The proper time to prune Norway spruce is about the 2nd of June. That is for this section. It would be later for the north. Just before they finish making their growth and begin to form the buds, by clipping the sides the buds will form further back. We have a hedge of it that grows about six inches every year, and we prune it the same as any other hedge, and it gets thicker every year; it is so thick that birds can hardly enter it. Of course I agree with Mr. Gilchrist as to ornamental trees, that they should be cut in only just a little. I would say that all evergreens require a good deal of manure. If they get plenty of food of that kind they will resist the winds on one side a great deal, and for trees that are already in that shape I do not know any other course than to trim off the other side and try to force the growth on that side also. Do the trimming about the latter end of June.

Mr. CRAIG.—I might say that the blue spruce grows very well at Ottawa: the principal trouble is a fungus that appears on the leaves about the 10th of June, and which is very bad now. The leaves are beginning to drop, and it disfigures the tree. This fungus seems to be the principal difficulty, and for it I am now trying the copper solution. Of the cornuses I think one of the most ornamental is the cornus sericea. Another that has not been mentioned is the tamarisk amarensis, which in Ottawa, however, is not quite hardy. Of the viburnums, probably the old English one is the best. Poplars I do not like, on account of the seeds and its sprouting habits. There is one of the American poplars that does not sprout, but I do not think it succeeds in this part of the country. Catalpa speciosa is not satisfactory at all; it will die the third or fourth year, and I do not think it is worth growing for an ornamental tree. Another tree which I think may be added to the list of hardy ornamental trees is the European larch. Of course it is not an evergreen, but it puts on beautiful foliage in the spring.

HUMBUGS IN HORTICULTURE.

The President announced that Mr. T. H. Race, of Mitchell, Ont., would read a paper on Humbugs in Horticulture.

Mr. RACE.—I have no paper prepared on the subject. I have met many humbugs in my time, and the list is a numerous one, but at the head of it I place the nursery jobber humbug. By that name I wish to indicate the man who claims to be a nurseryman, but who yet has not a foot of ground in the world, nor a single tree to his name. It has been stated here, and often elsewhere, that farmers are a class of people who take a delight in being humbugged; that they are better satisfied when they are being humbugged than when they are getting a fair deal. But even granting that to be so, the object of this Association is to extend and increase fruit-growing in this province, and I think for that reason it is our duty to protect the farmer from being humbugged, and to educate him up to a point where he will cease to feel any delight in the humbugging process. Our first object, as I have just said, is to extend the growth of fruit and its cultivation throughout the province; to awaken an interest among farmers as a class in this

industry. My experience is that it is not very easy to awaken such an interest in their minds. At present the farmer looks upon his orchard as the most unprofitable part of his farm ; sometimes, indeed, he looks upon it with a certain amount of disgust. He has paid for what he supposed was a certain kind of trees, but after a number of years has discovered that he did not get what he paid for at all, and that his orchard is filled up with a large number of Talman sweets or some even cheaper variety, and, there being no sale for those varieties, his orchard is neglected. I am not a protectionist, but I feel so keenly in this matter that if I were asked to construct a tariff for this province I would have to introduce that principle of protection first of all on fruit trees, on which I would place so high a duty that it would strike the nursery jobber, one that would be prohibitory on his goods. I find that nearly all these so-called nursery jobbers who have been humbugging the farmers, get their supplies from the other side. I have no fault to find with American grown trees, but the nursery jobber will buy his trees where he can get them cheapest, and the nurseryman to whom he goes to purchase them, knowing that he is responsible to the jobber only, and not to the jobber's customers, and that he has to put these trees in at a very low rate, is not likely to give him his best. As a result the nursery jobber fills the orchards of our farmers with the very cheapest trees that are to be had ; it is as a rule the leavings of the nurseryman's other customers that find their way into the hands of the nursery jobber. Therefore the farmer who buys from the nursery jobber runs the risk of getting just whatever the nurseryman has at his disposal at the time the jobber sends his order, and owing in a great degree to this the experience of the farmer is that seven out of every ten trees are a failure. I think that proportion will hold good throughout Canada, for it is based on inquiries I made last fall. When I was talking in this strain before the farmers in many places, I was fallen foul of by these very agents, and I have had some pretty sharp passages at arms with them. Farmers would ask me what nurseryman I would recommend. Now that is not a very pleasant question to deal with, but I always tell them I am not advertising any nurseryman, and mention the names of one or two of our prominent nurseries. Then they want to know how to deal with them to be sure of getting the right varieties, and at reasonable prices. In reply to that I recommend them through their farmers' institutes to make up lists of what they want in fruit trees, and then send their secretary, or some other live man in whom they have confidence, to deal directly with the nurseryman. By this plan I tell them they can get 25 per cent. off the regular list prices, which will pay the expense of sending a man to deal direct. Another question I am asked is, how they are to know these men who represent themselves as nurserymen and not jobbers, and how they can protect themselves. In answer I say that when a farmer wants to build a house, barn or stable, he does not wait until some carpenter comes along and persuades him he needs such a building and takes his order for the material, but he makes up his mind during the winter and begins to make inquiries where he can buy the material best and cheapest, and by whom he can get the work done most economically. If he will treat the matter of an orchard in the same way, and proceed to inquire carefully where he can best get the requisite trees, we will hear less complaints of the kind that are so prevalent among those who wait to be taken in by the first man who calls on them with a plausible tongue. I find it necessary to take this line in going out among farmers to talk to them of fruit-growing, for they have been so persistently humbugged that—although people will tell you they like being humbugged—you cannot arouse in them any interest in fruit-growing unless you point out some more satisfactory mode of dealing than the one the evils of which they have experienced in the past. But the nursery jobber is only one of the humbugs with whom we have to deal, for we frequently find humbugs in connection with reliable nurserymen among our own countrymen. Some of the regular nurseryman will send out as a sort of inducement a "catchpenny," as the saying is, and many of these have had the effect of souring farmers against the fruit industry. Not many years ago quite a number of Russian mulberries were brought into the county of Perth. I felt that the importation was a humbug when it first came in. Many persons inquired my views in regard to it, and I would tell them I did not know much about it, but would not recommend them to buy. It proved a regular humbug. The next was the Russian apricot, which in the northern sections of

this province is no doubt a humbug. Now, all these things have the effect of putting a damper on whatever interest may be felt in fruit culture, and do inestimable damage to the fruit-growing industry. I do not know how we are going to combat that kind of thing unless we can educate the farmers up to refusing things until they have been thoroughly tested by the Experimental Farms, where I think all these things should be tested before they are recommended for adoption. This Association has made a move in the way of increasing the interest in fruit culture by sending out representatives to the farmers' institutes. It is no use sending these men out to induce farmers to live and die in the very happy recollection of being humbugged. We want to attain some better results than that. There is another humbug which I will speak of now, which I did not mention before; that is the man who goes out and sells trees on the "home-grown tree" argument. There are lots of little nurserymen throughout the province who go out into the country among the farmers and persuade them to buy the home-grown tree. These men may have an acre or two, but they will turn over a book and show the farmer many thousand trees they have sold as being home-grown trees. Now if a man has only an acre of land and is selling thousands of trees he does not grow them on that ground, and he is just as bad as the nursery jobber.

Mr. CAVERS.—I represent the Galt nurseries. We send out many agents and we distinctly tell them we do not grow all the stock that we sell. Of course when our men are out canvassing we do not know what they tell customers. The more tender varieties of stock we could not grow as well as they could be grown elsewhere. We know that as the result of our experience, and we tell our agents to tell our customers that we can supply them with better stock of the tender varieties by not attempting to grow them ourselves. We do not know exactly what our men tell our customers but we distinctly inform them that all the stock they get is not necessarily grown in our own nurseries. We find that by growing only those varieties we can guarantee, we are able to give better satisfaction than if all were home grown. In the Galt district we cannot grow all that is called for. Now, what are we to do? Are we to be called jobbers and ruled out of the business because we do not have all home grown? And suppose a nurseryman is growing all this stock himself, is that a guarantee that the stock supplied a customer is what he says it is? The customer has to depend upon the reliability of the men he is dealing with in every case. We make it a rule to send nothing out of our nursery that is not exactly what it is labelled. Sometimes we substitute, but when we do we put on just what it is so that the customer may refuse it if he likes. If ever a tree goes out with a wrong label it is a mistake. Something has been said here about nurserymen sending out trees that are not suited to the sections of country they are ordered for. Nurserymen have to send out what is ordered, and in some cases where, knowing that what is ordered is not adapted to the climate, something else has been substituted because it was more suitable, the cry is at once raised that there was some dishonest ulterior motive in the substitution. Now, what are we to do for that? In discussing this question of humbugs it would not be amiss, perhaps, to take a look at it from the nurseryman's point of view. We always endeavor to do things perfectly upon the square, but you see the difficulties we have to contend with.

Mr. DENTON.—My own impression is that the further south you go the more delicacy you will find in a tree for certain parts of Canada, and my disposition would be to encourage more of our home selection. Referring to this question of humbugs which is under discussion it is very sad to go through my district, especially Lobo, and see so many orchards which men have planted and brought into bearing, and then found it was the commonest fruit grown, instead of being choice varieties such as these men paid for and expected to get from their trees. It is very hard in the face of that to induce men to enter more largely into fruit culture, but I think if they will take the list published in the "Horticulturist" it will overcome the difficulty presented. We all know that men who have stuff to sell will sell it if they can. I believe the gentleman who has spoken is perfectly honest, but are his men going to be so strictly bound down when their living depends on the extent of their sales? I think not. The farmers generally are ignorant of what is best for them to plant, and I think it is the duty of this Association, as has been said by my friend Mr. Rice, to go forth and educate them, and in ten years from this time there will be a great change.

MR. A. H. PETTIT.—I look upon this discussion as a mere waste of time. If we wait until the humbugs are all done away with we shall wait until the millenium.

THE SECRETARY.—I think it is a mistake to make any personal references whatever in a farmer's institute; I do not think we ought to disparage any local nurseryman by name in any of our meetings, nor do I think we should advertise any of our reliable nurserymen by name although we have every confidence in them. We should recommend those varieties that are desirable for planting and be unsparing in our condemnation of those which are worthless; but I do not think we ought to make any personal references one way or the other by name of either Canadian or American nurserymen. In regard to the Russian apricot, which has been spoken of, I believe it was sent out by nurserymen both in the States and Canada with perfect confidence, because it had not been tested. It has been found that a large number of these Russian apricots, introduced by the Mennonites from Russia, were seedlings grown from the fruit of trees that fruited in the southern part of Russia, down near the Black Sea, and I am told by a correspondent in Russia that that section of the country will grow tender fruit such as we cannot pretend to grow here: fruit such as is grown in California. Russia is a word which covers a very wide territory and the southern portion of it is a very mild climate. I believe, however, that there are some varieties of Russian apricots which have been tested at the Iowa Agricultural College that have been found hardy, and I am told by Russian friends that there is a variety of apricot, known there as Ansjustin's, which is more hardy than any of the varieties we have tried.

MR. McMICHAEL.—The gentleman from Galt has said that they sometimes, under some circumstances, take the liberty of substituting. I remember a number of years ago giving an order for a considerable number of pear trees, and in filling it the nurseryman substituted some varieties and said he had not what was ordered in stock. All the substitutes with us were found to be totally worthless when they came into bearing.

MR. MORTON.—One humbug in connection with this matter and connected with the Canadian nurseryman is the humbug of the agents nurserymen employ. The nurseryman, according to what was stated by the secretary a minute ago, is no better than the farmer, because, if the apricot was introduced in the way he says, it proves to me that no person of any common sense would send out a thing in perfect confidence because it had not been tested; I cannot see that it at all follows.

THE SECRETARY.—He might not have known that it was a fraud.

MR. MORTON.—I think a person who introduces a thing, recommending it as likely to prove beneficial when he does not know anything at all about it is the next thing to the man who will recommend that which he knows positively to be worthless. A person has no right to recommend a thing of which he does not know anything. However I do not wonder at their adopting that course when I find that in appointing agents they follow a similar plan. Their agents have not been tested, and consequently, as in the case of the apricot, they have every confidence in them. Of course it is well known that some firms have had experiences the reverse of pleasant with their agents. In my own section several instances have come under my notice of orders having been duplicated by agents or raised on the face of them. I must say in justice to the nurserymen that in no case have they refused to do what was right in the matter, according to my opinion. In a great many instances the agent does not know anything about the business. I have had experience with several. One man, who came to me to sell me grapes—I pretended not to know anything about them—recommended the Niagara as of better quality and earlier than the Champion. I asked him what quality the Champion was and he said he was not quite sure of the color but he knew it was a sour grape. Now I think it is folly to send out an agent like that. It is to the advantage of the firms themselves to see that the men who represent them understand their business and are straight and honest, because on their shoulders must fall any slip made by the agent.

MR. WELLINGTON.—It is not often I take part in a discussion that lays me open to the charge of talking "shop," and I am very sorry the present discussion has assumed the form it seems to have assumed. I fully appreciate the remarks made by Mr. Morton, but

perhaps if that gentleman had twenty years experience in the handling and management of agents he would be better qualified to offer advice calculated to enable me to overcome the difficulties encountered in running agents. There is much to be said against agents and nurserymen and there is also much to be said against cunning fruit growers and farmers, and when we touch upon humbugs we touch upon a very wide subject: one which might occupy a great deal more time than we have at our present disposal. In the discussion of humbugs I might tell you of many little frauds which we hear of as being committed by farmers in bringing their goods to market. All these things are very disagreeable when raked up before a class of people who live in glass houses and who therefore should not throw stones. The fruit tree agent has been of service, even with all his humbugging, because the experience people have had with him has made them more careful. The matter rests entirely with the people themselves. As nurserymen we have many difficulties to contend with and we try to meet them squarely and to deal with them in the most effective way suggested by our experience, and there is more honesty in the business than we are generally given credit for. Regarding the Russian apricot, we gave it a very fair test as to hardiness; as to the quality of the fruit we were aware we could not depend on its being uniform, but as an ornamental tree sent out singly it was no humbug. These things have to be experimented on and tested by the fruit grower as well as the nurseryman. They were introduced in the first place from Russia and they were tested by a firm who bore a very good character in Nebraska to begin with, and I do not think they will prove a humbug altogether. The same firm introduced the Russian olive, in regard to which we have been very conservative—we would not put them out at all. Prof. Saunders tells me, however, that they are a perfect success, and he thinks they are perfectly hardy at Ottawa. It is a novelty as a fruit that will never amount to anything, but as an ornamental shrub it will be a success. Still it will be denounced by some as a fraud and a humbug. We should look at these things and consider before making sweeping accusations against any class of persons.

Mr. RACE.—I am in thorough accord with the secretary in his remarks. I do not think it is a good principle to mention names either in a favorable or reverse manner and I have always, where I could avoid doing so, refrained from it; but it is not a very easy thing to do when you start out to talk to farmers about fruit growing, they will crowd you until you almost have to do it to satisfy them. At Meaford I took the platform at seven o'clock and the farmers, who are very keenly interested in fruit growing, kept me until ten o'clock plying me with questions. There were quite a number of agents present, but the farmers cornered me up so that I was forced to mention some of these names. As long as we have in our own country reliable nurserymen able to supply the demand I think we should recommend them, and advise our institutes to send men to buy from them what they want, direct from the nursery.

COMMITTEES, REPORTS AND QUESTION DRAWER.

After considerable criticism and several changes in values of the apples, the fruit list for Ontario was finally adopted by the Association. The list, as finally adopted, appears at the end of this Report, for convenience of reference.

FRUIT COMMITTEE.

The SECRETARY.—I think the present is a very suitable time for me to suggest the appointment of one or two committees. In the first place we have a little fruit on the table, and we must ask the President to appoint a committee to inspect it carefully and report on it. I had a couple of baskets of strawberries sent me three or four days or a week ago, with a request that I should bring them before the Fruit Committee of our association. Unfortunately they were in no condition to present when I came away from home. They were of a new strawberry which originated near Brantford, called Prince of Orange, or Williams' improved, so called from the originator, Mr. Williams. They were sent me by David Greig of Cainsville. The berries are certainly extra large and fine, and

he tells me that they have created quite a sensation in that section, and are quite the rage among the strawberry growers, who are all trying to get them. He believes it is the coming strawberry for that section of the country, if not for the province. I am very sorry I was not able to bring the samples with me.

The PRESIDENT.—I shall appoint Mr. Nichol, Mr. Pafford and Mr. Dempsey as a committee on the fruit exhibited here.

OBITUARIES.

The SECRETARY.—I have now, Mr. President, to make an announcement that I am sure you will all be very sorry to hear. I have here a communication containing an announcement of the death of Mr. John Croil of Aultsville, which was sent to me about a week ago. Mr. Croil, who was sixty-five years of age, died at his residence on the 28th of June. This loss is in connection with our own society, and we have also to deplore the loss sustained by the Montreal Society in the death of their Vice-President, Mr. Charles Gibb, to whom we are all so largely indebted, and whom we so often welcomed in our own meetings. I think it is desirable that a committee should be appointed to draft resolutions of condolence and sympathy in regard to the loss of these esteemed deceased friends.

The PRESIDENT.—I appoint Messrs. Race, Beall and Craig.

Mr. Beall asking to be excused, Mr. A. McD. Allan was appointed on the committee with the other gentlemen named.

MARKETING FRUITS:

The PRESIDENT.—One of the questions set down for discussion by the Association at the present meeting is, "What is the best method of selling small fruits in our city local markets?" We will hear what our Secretary has to say on that point.

The SECRETARY.—There is a great prejudice against the sale of fruit by auction, and perhaps there may be some reason in it. It has been tried to a certain extent in the city of Toronto, not perhaps with the most encouraging results, but I am of the opinion that if it was undertaken by reliable persons, and carried on in a systematic, business-like manner, it would be to our advantage to have fruit sold there in that way. There would certainly be no opportunity for growers to be cheated as to the proper sales made, because it would all be done in a public way. Fruit is a commodity which must be sold at once, whether by auction or by private sale, and if the public once became aware that auction sales of fruit were being held regularly I think the highest prices would be realised in that way; certainly the fruit should bring us a fair value if sold in that way. Some days, no doubt, there might be a loss, but on the average I believe an open sale, regularly conducted, would result to our advantage. The question was suggested by Mr. Allan, I think, who desires to get the opinions of the growers in this part of the province, and that is my opinion as one of them.

Mr. McD. ALLAN.—I did not expect to speak to this question, which I suggested merely for the purpose of eliciting information and the opinions of the growers themselves, based on their experience in selling both by auction and in the ordinary manner. If the system of selling fruit by auction is adopted the auctioneer, in the first place, should be a person well versed in fruit, and having a thorough knowledge of its value. He stands between the buyer and the seller, and he should be a man who will not either knowingly or unknowingly do an injustice on one side or the other. He should know the value of each grade of fruit before him, and what it ought to realise. At the same time he should protect the purchasers, that is, he must not misrepresent anything, but give them the fruit required for their particular custom or trade. It seems to me that if he understands his business thoroughly, and is willing and able to conduct the sales properly, the plan must be a success, and I am of opinion that upon the whole the auction system would be the most advantageous for all interested.

The PRESIDENT.—Is it not the system most prevalent in the markets of the old country?

Mr. ALLAN.—Yes, almost entirely. Everything of that sort is sold by commission houses at auction. I think in Toronto the auction system would be most advantageous both for the buyer and the seller.

Mr. WELLINGTON.—I think the auction system, properly conducted, is the right way of disposing of fruit. It would be well for fruit-growers to understand that Mr. James Lumbers was the gentleman who inaugurated the auction system, which he worked up for a younger brother, and so long as the business remained in his hands everyone who had any dealings with him got full and correct returns. He informs me that some of the fruit-growers were themselves to blame for the ultimate failure of the system, inasmuch as they made contracts with storekeepers in Toronto for their crop up to a certain date, and sent the best of their fruit direct to the stores and the poorer fruit to auction. This fact, coupled with the opposition offered by the storekeepers, who were making money faster under the old system and did not wish for the change, was in the main the cause of the failure of the auction system. Another cause was the want of proper quarters, and of proper facilities for handling fruit direct from the railway stations and steamboat wharves. These drawbacks combined were, I think, the cause of the failure of the auction system. In the hands of a good man I think it would eventually succeed, but in the first instance opposition would be encountered from the storekeepers in Toronto, who would do all they could to discredit the auction system in the eyes of the public. If the fruit-growers were to establish and support an auction system I believe they would in the end obtain better results in selling their fruits. The store keeper is the one who gets the profit on the fruit; the growers have suffered very severely. Many times I have seen strawberries sold at some of our large establishments, where they have a good ~~class~~ of custom, at twenty cents when I knew that the average returns to the grower were not more than five or six cents; the shopkeeper gets fancy prices for the good fruit, and very fair prices for the rest. Now, to make the auction system a success, there must be a combination among the growers and they must support the auctioneer. The first step is to get a good responsible firm or individual to handle the fruit at that auction and then give him hearty support and keep the fruit away from the shopkeepers; that is, do not sell to them direct and then they will have to buy it at the auction and pay its value for it.

The SECRETARY.—I have noticed in shipping that a great many of these commission houses to whom we ship not only sell on commission but speculate on their own account, and of course when there is a glut in the market it is not until they have disposed of their own that they offer our fruits, and as a natural consequence we get the worst of it. I have had some very sorry experience of that kind with perishable fruit and got almost nothing at all for it, though shipped in good, sound condition. It was not until after what the fruit dealers had in stock was sold, at good prices, that it was offered. In one instance I know that they had bought on contract a large number of Bartlett pears when the market was high. The market rapidly went down and pears I had sent were not sold until the prices were down to the very lowest notch. That is what makes me feel a little dissatisfied with the present method. If we had an assurance that a house would act solely in our interests we would have more confidence in getting fair treatment, but as things are now we do not feel that we are being fairly dealt with.

Mr. WELLINGTON.—That is the basis of my statement. Some pears are sold direct and others shipped on consignment, and the latter have to take their chances while the others are placed on the market when prices are high. Of course the commission men will take care to protect themselves first.

Mr. PETTIT.—We have now what Mr. Woolverton was speaking of—agents in every city. I think we have six agencies in the largest towns and cities in the Dominion.

Mr. BUCKE.—What is the objection to that system. I should think they would get the best returns from their own agents.

Mr. MORTON.—I suppose public competition has an effect on the purchaser. Men will often pay a great deal more for an article at auction than they would by private contract. That is my experience of auction sales in other lines.

PACKAGES.

The PRESIDENT.—The next question is "Should Raspberries be sold in pint baskets?"

The SECRETARY.—I have had no experience in pint baskets for raspberries, but I have noticed that in the New York market raspberries are sold in pints and as small measures as thirds or half pints. That seems a good deal of wood for a very small amount of fruit, but I think that in a quart box too many raspberries are put together; they pack very close and you get more than a quart of raspberries in a quart measure it seems to me. If the basket were not quite so deep it would be an advantage, and for that reason I think the pint would be better.

Mr. CRAIG.—The pint basket is growing in favor in Chicago and other western markets.

Mr. MORTON.—I am in favor of a shallow basket as ripe raspberries break down more easily than strawberries, and even in the latter with some varieties we are bothered in the same way.

Mr. RACE.—The fact that one has no guarantee of fruit reaching its destination in good condition has a bad effect upon the demand. It is impossible in any of our smaller towns to get a basket of peaches delivered. I had some experience in that way last year when getting peaches from the secretary. Could there not be some light cover devised that would protect us from pilfering?

The SECRETARY.—I do not think that applies so much to crates in which we ship small fruits as to peaches, which we cover with leno.

Mr. RACE.—I know we would get many more plums and peaches if we knew we could get such packages as I suggest. As it is we know there is a very great risk, as the express companies tell us it is difficult to deliver a consignment in good shape to a private individual, because it is supposed that the latter is not so likely to complain as a large dealer. As soon as I let them know I was a director of this Association they stopped the pilfering at once.

Mr. BUCKE.—The best way would be to ship by weight and if there is any difference when they are delivered let the express company bear the damage.

A MEMBER.—I sent some peaches from Winona to a friend in Hamilton last fall and the next morning when he got them there were two of the worst looking baskets of trash you ever saw.

Mr. RACE.—There would be a large increase in the demand for fruit from my locality if there was any assurance that fruit shipped to us by express would be delivered in anything like proper condition.

A MEMBER.—If the baskets were fixed in the way you suggest would the consumers pay extra for the fruit—the extra cost?

Mr. RACE.—The additional expense would be very small; you would only have to add a little more to the price of the fruit, and I know the people up north would be willing to pay a little more if there was any assurance of the fruit reaching them in good condition.

The SECRETARY.—A wooden cover could be had for about a cent a basket, which could be wired down, in addition to the leno covering.

Mr. CLINE.—I have had fruit stolen even from baskets with wooden covers wired on.

Mr. WELLINGTON.—There is no doubt this is a matter which should be taken up and some measures adopted to remedy it. I am in the habit of having sent to me in Toronto from my own place some choice specimens and I do not think that in any case has the package ever reached me in the condition in which it was dispatched. Some of the best clusters of grapes would be taken out of a basket and the same applies to peaches. A man who wants two baskets must have three sent him to make sure he will get the quantity he desires.

The SECRETARY.—I was at Caledonia station the other day and saw a lot of strawberries that were being shipped in from Buffalo, which were there an hour waiting to be transferred, and the boys and everyone else were helping themselves through the openings. Now, what are we going to do about it?

Mr. WELLINGTON.—We ought to take some concerted action.

Mr. RACE.—I wrote a letter to the express agent telling him I intended to bring the matter up at the next meeting of this Association with a view to having a deputation sent to the government to see if some legislation could not be enacted whereby we could recover damages for this kind of thing. I said that at the present time there was no law that I could put in operation without going to too much trouble and expense. That letter was sent to the head office and I saw the letter sent to the agent in reply to it. It was, to go and see this man and settle his claim at once and have the agitation checked. So it is evident they do not care about having any agitation of that kind. I think their fear of such a thing is the very best proof that we should make a move in that direction.

A MEMBER.—I think the difficulty in making private consignments might be got over by having some kind of package in place of the open baskets. Of course that would not do for the open market, where dealers like to have them covered with material that gives a good appearance, but I think peaches shipped to private individuals might be sent in crates, which could be had at a trifling expense.

Mr. ALLAN.—That would only be an inducement to the Express companies to throw them about. We had a thorough illustration of that at the time of the Colonial Exhibition, when our stuff was sent over in boxes.

Mr. RACE.—I propose that a deputation be appointed from this Association to wait upon whatever government has power in the matter and to see what can be done.

The SECRETARY.—I think we might get something done. I move that a committee be appointed to interview the government in regard to the matter and see if some legislation bearing upon the question cannot be devised. I suggest Messrs. Race, Allen and Cline as members of the committee.

Mr. MORTON.—I apprehend very great difficulties in any scheme such as is asked for. There are only two remedies against the company, a civil one or a criminal one. I very much doubt our getting legislation pointing to a criminal liability, and as for a civil liability it might be said that we have already the same remedy as any other individual. The difficulty at the present time is to prove that the fruit was stolen. The Company, in a case of this kind, would stand on strict legal ground and everything would have to be proved—that the fruit was in perfect condition when shipped, that the damage took place on the way, etc. I have grave doubts as to whether the government would interfere in the matter, but of course it will do no harm to point out the evil.

Mr. CLINE.—I knew a shipper who took a receipt for every package and he did not have any trouble; there were no missing baskets, or, if there were, they were paid for; but it is a good deal of trouble if you are not at the station early enough for the agent to look at it and see that the packages are all right.

Mr. MORTON.—If that is the case then the shippers are more to blame than the express company. By neglecting to get that receipt he is simply putting a premium on dishonesty. I think the shipper should avail himself of every existing means of avoiding the effects of dishonesty, and when he has done that and still suffers it will be soon enough for him to complain.

Mr. WELLINGTON.—That is all very well as to the packages, but it does not apply to the abstraction of a few of the best bunches of grapes from a basket. I do not know what the present legislation is, but I think something might be framed to make the punishment of this pilfering a little more easy than it is. I think the case is a proper one to be investigated by a committee.

The Association then adjourned to meet again in the evening.

THE CURCULIO.

The PRESIDENT.—Mr. Billups will now read to us his paper on the Curculio.

MR. BILLUPS.—I have not had at my disposal sufficient time in which to prepare such a paper as I would have desired to read before this Association, but I will endeavor in a few words to give a brief outline of the curculio family. I may say, in the first place, that the curculio is distinguished from other coleoptera by having the head prolonged in all cases into a snout of greater or less extent; in some cases that snout extends three or four times the length of the whole insect, while in others it is scarcely noticeable. The curculio in fact is a very hard family to define; it is hard to say where the true curculio begins and ends. I have upon the table here a fair representation of all the different genera of the curculio known throughout the globe. I think it would perhaps be well to give a brief outline of the life history of the insect, and in doing so I do not think I shall be far wrong in taking the familiar plum curculio as an example, it being I believe a fairly typical species of the great family Curculionidae. So infinitely small are many members of this family that it is difficult to give to one unaccustomed to them any idea of the differences which exist in the different genera, but to the eye of one accustomed to handling such small insects the difference is vast. In the diagram before you you see in No. 1 the larva of the curculio. No. 2 shows the next stage, the chrysalis, and No. 3 the perfect insect. I have in a bottle here the egg of the plum curculio. This curculio bites and destroys a great variety of fruit; the cherry, the plum, the peach, and I believe in some instances the grape. It lays its eggs early in the spring upon the plum. The female commences by working a small puncture in the skin of the plum, as represented in No. 4, and deposits the egg, and makes a semi circular bite around the spot on which the egg has been laid. This causes the skin of the plum to wither and dry up, and affords food for the young grub. When first hatched I have generally noticed that this grub, after spending a short time in the exact locality of its hatching place, moves in a circuitous manner around the skin of the plum, and finally ends up very near the stem. This causes the plum to weaken and rot around the stem, and either by its own weight or by the first windstorm it is caused to fall to the ground. The larva, which during the time the plum rotted had a sufficient period in which to gather strength, after a certain lapse of time disappears into the ground and changes to the chrysalis state, No. 2. I am sorry to say I have no specimens of the chrysalis, but I have a number of specimens of the larvae in different stages of advancement. Now, as regards the methods of destroying the curculio, which I suppose is the most important thing to this meeting, as far as my experience goes the only true way to get rid of them is to gather up the fallen plums. I think it is almost impossible to do anything by waging war against the perfect insect, as the perfect insect eats very little. Nearly all the feeding in insects of every order, I may say, takes place when it is in the larval state. The object of the full grown insect is chiefly to find a resting place for its egg, and that done its usefulness is over, and it dies. I think the plum curculio lays from thirty to as high as fifty eggs. Of course that means if there are twenty or thirty curculios on one tree that not much of the fruit is going to escape. The curculios are all vegetable feeders, some of them live upon the seeds of plants, some upon the stems, and a great many upon the fruit. It is generally supposed there are only a few injurious curculios, which I suppose is owing to the want of taking sufficient interest in the masses of vegetation by which we are surrounded, but there are very few plants in this or any other country but what have their own special curculio. I think there is no just idea formed of the vast number of curculios that exist upon the earth. The best catalogue we have, the Munich catalogue, which is five years old, enumerates 10,000 distinct species, but I think that in the past two or three years there have been some hundred or more specimens discovered new to America. I think Prof. Brodie, of Toronto—I am not certain in making this statement—told me he had fifteen or twenty undetermined species that he had found in Canada. If that is correct, and every entomologist has done as much as he has, though he has not made a specialty of curculionidae—if they have all taken five or six undescribed specimens, there must have been an immense swelling of that Munich catalogue. I have here one of the larger curculio, which attacks the sugar cane. It is one of about the largest size that exists. From

the facts I have given it will easily be seen that it is a family of very small and insignificant beetles that we have been dealing with, but although small, the amount of damage it does is larger than that done by any other family of beetles. Now, in the case of the larger wood-boring beetles they do not do damage, but good, and if it were not for them in a short time we should have no forests. That seems rather a wild statement to make, but looked at carefully it is a very true one. In the immense forests of Brazil, Mexico and southern countries, numbers of trees have been blown down by storms, and if there were nothing to assist the process of decay there would be such a tangled mass of fallen trees that nothing else could grow on the space covered by them. But the wood-boring beetle steps in and deposits its eggs on the bark of the tree, and in a very short time the whole mass of timber is perforated thoroughly by these immense beetles, places for moisture are formed, and in a very short space of time the tree decays and is reduced to dust, which, mingling with the earth, induces new vegetable life. I do not think, however—certainly I have never observed it—that any of the curculionidae do the least good. I do not know that there is one good point about the family curculionidae at all; the only beetle I know of that has been made of any use to mankind is one of the larger curculio, the grubs of which are eaten by the natives of some countries, and deemed very delicious. Generally then they are injurious, and being such a small beetle it escapes the eyes of many insectivorous birds, and at any rate it is a very hard, unpalatable thing. I think they are the hardest shelled beetles in existence, taking a small, hard steel needle to pierce them. There is one thing in connection with this subject that needs alteration; there has been little or no individual research either in this country or in England. We find in the reports of the entomological societies of Canada and other countries that the same facts are being brought before us dozens of times, and these facts are the result of the researches of men who lived a number of years ago, and, after all, many of the papers written by able men are but recapitulations of the work done by others. Now, this is not the case in other branches of entomology, and I think it a pity it should be allowed to be so with Curculionidae. To give one instance of the small amount of interest and study that has been devoted to curculionidae in Canada, I may state this: During my stay in England I visited some twenty of its best museums. In the South Kensington branch of the British museum, which contains the best entomological collection in the world, our Curculionidae were represented fairly. In the Oxford museum, the second finest in the world, there were barely one hundred specimens of our Canadian Curculionidae. In other countries the Curculionidae were better represented in their larger and more showy insects, but there were only about one hundred specimens out of our five hundred species. It is my wish, if I can secure help from any entomologist in Canada, to send over this fall a fairly representative collection of our Curculionidae, and I only hope I shall be able to get that help. I cannot do very much myself, being unable to move from one locality to another, and I hope I shall have help from everyone who is able to give it, and if such persons will only try to assist me in getting specimens I shall be doubly obliged. I think it is only right that the Dominion should be better represented than it is at present in England.

Mr. MORDEN.—Does the ordinary plum curculio attack cherries and pears, or is it a different variety.

Mr. BILLUPS.—The ordinary plum curculio this year destroyed nearly ninety per cent. of the crop of a cherry tree. The tree was unsprayed and not protected in any way, being one left in that way as an experiment. This tree was situated some two hundred yards from any plum tree.

Mr. MORDEN.—What about pears?

Mr. BILLUPS.—I have specimens in a bottle here; I think there were about thirty pears on the tree, and none had less than one, and some three or four bites of the plum curculio.

The SECRETARY.—It also affects the apple?

Mr. BILLUPS.—Yes, that is a pretty well known fact, but I have not made any experiments.

The PRESIDENT.—And the peach?

Mr. BILLUPS.—Yes, it attacks the peach. I do not think it will ever become sufficiently dangerous to the peach to excite much alarm.

A MEMBER.—Too much wool?

Mr. BILLUPS.—Yes, too much wool. If a curculio finds any dirt or dust on a plum it is working on it will generally leave it for a clean one.

The SECRETARY.—You think the application of some other dust than Paris green would work almost as well?

Mr. BILLUPS.—I may be making a rash statement, but I believe if trees were dusted with powdered ashes it would be just as efficacious as Paris green.

The SECRETARY.—I have a row of cherry trees on the roadside, where it is dusty, and I seldom find them affected by the larva of the plum curculio; that would corroborate your theory.

Mr. BILLUPS.—Yes; I am very glad to hear that statement. So far it has been my theory, unsupported, but I do not think I am wrong in saying it. I may not be entirely right, but I am right to a great extent. I believe that Paris green acts more as a mechanical agent than as a poison. I think when we take into account the small amount of food necessary for a curculio, and the limited space it touches upon the plum, it will be evident that it can get but a very small dose of the poison.

Mr. McMICHAEL.—Does the larva of the curculio resemble the larva of the codlin moth in its habits?

Mr. BILLUPS.—No; it stays in captivity until it is fully ready to enter the earth.

Mr. McMICHAEL.—Paris green has no effect upon the larvæ?

Mr. BILLUPS.—No, not the least, because it never sees daylight until it is ready to enter the ground; all the work is done in the skin of the plum.

A MEMBER.—In regard to the curculio not liking peaches, there cannot be any dust on my peaches, for they seem to take them very freely; I found two rows in which I do not believe there was a single peach that had not been bitten two or three times.

Mr. BILLUPS.—I am much interested in learning that fact; it only shows more clearly that the curculio is one of the worst enemies the fruit grower has to contend with. It would seem that the plum curculio attacks almost any kind of fruit.

The SECRETARY.—About what length of time do you find that the beetle continues its operations?

Mr. BILLUPS.—As soon as the plum blossom falls it begins, and the day before yesterday, July 7th, I found a curculio in the act of laying its egg, which shows very clearly that it is incessant. I very carefully watched the tree, and I am satisfied my statements are correct. I have seen them on the plum, searching around for a place and have seen it force in its beak and withdraw it, and prepare to lay its egg. I think that is a thing that Mr. Saunders does not mention in his book—the length of time the curculio operates.

Mr. MORDEN.—I think it ordinarily does its work in about ten days.

Mr. BILLUPS.—Well, the injurious work is probably done at that early stage, because after the fruit is well developed the curculio is comparatively harmless to the fruit, though it spoils the look of it. I have had pears, for instance, bitten three or four times; it does not actually kill the pear, but it makes a little rough place. Some people think that the better fruit is not attacked, but I do not think that is so. It is because the better fruit is taken more care of and sprayed more frequently. I think they are just as likely to attack the better plums as the blue common plum.

A MEMBER.—Is there any parasite of the curculio?

Mr. BILLUPS.—Yes; but at present my experiments are in such early stages that I am not prepared to make any distinct statement on the subject. I may say, however

that there are to my certain knowledge two or three distinct parasites of the curculio. The question arises whether we can so foster and encourage the parasite that in time it will become stronger than the curculio, and eventually wipe it from the face of the earth altogether. I am trying a few experiments on a small scale to find out. Another curious thing about the curculios is that they seem to come suddenly and to disappear suddenly. Four years ago the corn weevil was very scarce in this locality, and the next year it appeared in vast numbers. I found it on the white oak, the red oak and on *Quercus robur*; on three oaks. That in itself was a rather remarkable thing, as entomologists have hitherto noticed it only on the white or the red oak, I am not sure which, while I found it distinctly on three oaks. This year I have found traces of none, except one perfect insect I found on the 24th May, and the year before there were none. They seemed to appear one year and disappear entirely the next. In this Prof. Brodie's notes agree exactly with my own.

PEAR BLIGHT

The President called upon Mr. McMichael, of Waterford, to speak on his experience with pear blight.

Mr. McMICHAEL.—This is a subject in which I am very much interested, sadly interested this year and last year. I think it is now about twenty-five years since I began pear culture, and during that time we have had three recurrences of the pear blight. We would have about three years during which the blight was bad, and then perhaps five or six years freedom from it. We have also found that during the time it was bad in the pears it was also equally bad on the apple trees. In my pear orchards, where the blight has been worst, usually there has been an apple tree badly affected, and from that it spread very much worse to the pear trees. Where we have taken those trees out we have very much sooner got rid of the blight. Last spring—I may say that previous to that we had not been troubled for a number of years—I commenced cutting on it about the middle of July, and I have reason to regret that I did not commence a month sooner. This year, in an orchard of about 150 pear trees that have been planted out nearly twenty years, the trees had suffered a number of years with a fungus which caused the wood to become very brittle and hard, and this spring, I think on the 9th of June, I commenced working in them, and the points of attack would average from fifty to seventy five or a hundred in each tree. They were in the twigs, and under the twigs. With one hand I broke the twig out: and with the other, with a paint brush filled with linseed oil, I went very thoroughly over the orchard, and I have done so four or five times since, and in scarcely an instance where this was taken out did the blight reappear. A few days after that I went into another orchard of trees, set out about eight years, which were remarkably thrifty, the growth long and the limbs just curling over and the tree full of bloom, but in those trees I found it very difficult to cope with the blight. The great difficulty is down on the limbs: these little twigs blighted, and in three or four days the bark would be colored, but by going over them every other day, just as the leaves began to turn, the art of taking these twigs off with a knife and painting over with linseed oil, I was enabled to save the limb. I had been led to believe, by the treatise of Prof. Burrill, that all the virus entered through the bark, or where it was punctured, but in this orchard in nearly every instance it entered through the ends of these little matured leaves or the blossom, and, where these are cut out, just a little paring around it stops it. The bark being punctured the virus might easily enter again, but the oil has a tendency to keep that out by closing the pores. If that orchard of eight hundred thrifty trees had been left until now without taking those diseased portions off, I might as well have burned every tree, but the present indications are that we shall be able to save it. One of the mistakes I made was in not cutting low enough; you have to cut three or four inches below any coloring of the bark, or the blight continues. In the other orchard, where the limbs are hard, there was no difficulty in staying the blight.

A MEMBER.—Is painting without cutting any good?

Mr. McMICHAEL.—It is no good unless you cut below the blight.

Mr. MORDEN.—Did anyone ever paint before the leaves came out?

Mr. McMICHAEL.—I did for a number of years, with the body and the limbs, and there was no trouble. I thought oil was a preventive; but my impression now is that the virus enters mostly through the leaves, so of course it would not do any good. But it is a very great benefit to prevent the virus entering; you see in cutting off the limbs that that is the place where the virus can enter. It is very difficult to avoid making some little breaks in other limbs, and the painting with oil over them prevents the blight entering.

Mr. CLINE.—Did you ever try leaving the blight on the tree and letting it spread?

Mr. McMICHAEL.—No.

Mr. CLINE.—I have tried it and it never has gone any further.

Mr. McMICHAEL.—In our locality there are lots of trees entirely dead.

Mr. CLINE.—It just killed the top limbs down four or five feet. They were pretty tall trees and I never cut them off.

Mr. McMICHAEL.—Going from our place to Brantford wherever the trees were left they are all dead, but where part was cut out it saved the trees.

The SECRETARY.—Mr. McMichael has the impression that Prof. Burrill states that the pear blight only enters through the bark.

Mr. McMICHAEL.—Yes.

The SECRETARY.—Professor Burrill told me last year that the point through which the blight most commonly enters is through the blossoms and the young growth at the end of the branches. It may have been a previous statement of his that Mr. McMichael saw, but I thought it best in justice to the Professor to mention it. His latest investigations seem to have convinced him that it is chiefly through the blossoms that the spores of the pear blight fungus find their entrance into the tree. Therefore just after blossoming time, as soon as we discover the least indications of blight in the blossoms or the leaves about it, we should carefully go over our orchards and in that way we may be able to save the trees.

Mr. McMICHAEL.—My observation is that it enters more through the leaves than the blossoms, and in four or five days the tree is destroyed if these are not taken off.

A MEMBER.—Is there any difference as between trees that are cultivated and those which stand in sod?

Mr. McMICHAEL.—It seems at the first output of the leaves that it is as bad in trees that are not thrifty, but it continues very much longer in the thrifty trees. It is also my observation that where trees have been manured with barnyard manure they are very much more liable to it than where ashes have been used.

APPLE PACKING.

The PRESIDENT.—I have no doubt there are many here who are interested in apple packing. Mr. A. McAllan will now address us on "Repacking apples in Britain; drawbacks and advantages; why repack, and how."

Mr. ALLAN.—This is a question I suggested for the purpose of drawing out certain information which I am interested in getting. I suppose you are all aware that I am intimately connected with the Imperial Produce Company of Toronto, a company which is engaged in handling all kinds of Canadian produce in the British markets, and it is my wish to make special experiments in a great many lines in the interests of the fruit growers of Canada. This question of repacking occurred to me four years ago when I

was over in Britain at the Colonial Exhibition. A great many cargoes of the apples that are packed and shipped from Ontario and other parts of Canada to Britain arrive there in very poor condition. This arises from many different causes. In the first place some of the apples are not fit to be packed or put in the barrels—apples with particles of rot upon them or fungus spotting. They are very apt to heat from some cause, and the result is that rotting takes place and the barrel of apples is more or less damaged. It is rather the exception to find a cargo that comes out entirely in fine order; there is more or less damage, which those who ship over there will have seen mentioned in the returns mostly as "slack, wet." It occurred to me, and I carried the idea into execution, to take a cargo of that sort, open it up, and repack it. Of course there are a great many objections to repacking. I would not advocate repacking a good barrel of apples, as a rule, because there are more or less bruised specimens in it, and you would really lose a considerable number of the apples by the repacking, that is there are a considerable number you cannot call first class specimens fit to repack in a smaller package. But in the case of a damaged cargo I have known instances where it would be impossible to do otherwise than lose money for the shipper by placing them on the market in the shape they were in. There would be no way of disposing of them in the condition in which they were landed and making money of them for the shipper. Then the question is what can be done? I find in the majority of cases of that sort that there is a large quantity of really good apples, for which, by repacking them in a smaller package, I could realise fairly prices. For well culled, uniformly sized, finely colored fruit an extra price can always be realised in the British market, and by observing that I have been able to bring the shipper out money in pocket when he would probably have been at a heavy loss otherwise. Now, I would like to hear from those who have had personal experience in this matter of repacking what objections there are to that method. Our company has the idea of going into it if it is found to be in the interest of the fruit growers in Canada. We have all the accommodation and necessary arrangements made to do so and at a comparatively nominal cost to the shipper or grower. My own belief is that it is going to be largely a matter of experiment for I have met very few persons who have any actual experience in it. You must look for a loss in repacking; but under any circumstances, with such cargoes there is more or less loss at any rate. I would prefer selling the fruit in the original package if it was in anything like the proper condition, but, as I have said before, such cargoes are rare.

THE SECRETARY.—You spoke of putting the apples in a smaller package. What description of package?

MR. ALLAN.—I trade the barrels off for boxes and baskets; anything I can get. There is little or no difficulty in making a trade of that sort and I certainly found it advantageous to sell in small packages. I see but one disadvantage in getting round-hand packages. They judge fruit in the British market by the package in which it is. If they see a fine, well got up package they want to see what's inside it and they conclude at once that a man who has packed in that way cannot afford to put a poor article in the package. Every one is keen to get hold of such packages and they will always pay more than enough to cover the extra cost of packing.

A MEMBER.—Would you ship half barrels?

MR. ALLAN.—Yes; I think so. We used to sell pears by the barrel, but pear growers have learned that there is more money in selling them by the basket. You can make a good deal more money by selling them in the smaller packages even in our own markets.

MR. NICHOL.—What do you think of box crates holding a bushel and a half of apples?

MR. ALLAN.—I believe there would be more money than in shipping in the ordinary way in barrels and they would not cost any more. For one firm we are making a specialty this year by putting up apples in crates, so many boxes to a crate. The boxes are supplied with a pasteboard division the same as egg boxes and an apple in each division, packed just as eggs are. They are putting up fine Wealthy and Famous apples that way.

MR. NICHOL.—I think they would be more careful with a box than a barrel, which is rolled, would they not?

Mr. ALLAN.—Yes ; though they are getting into a better system of handling now. On the other side barrels are handled much more carefully than here. The only objection to a square package is that you cannot pack as tightly or well to keep them from moving. I would not advise the putting up of anything except very choice fruit in the small packages, nor in any package for that matter, because it takes as much labor and costs as much money to pack and send across a poor lot of apples as it does for the best.

Mr. NICHOL.—Have you tried rolling them up in tissue paper ?

Mr. ALLAN.—I did try that a good many years ago and on that occasion it came out well, but to what extent that could be profitably carried I do not know. You will find a good deal of fruit handled that way in Covent Garden. Something of that kind could be done with extra fine specimens in repacking. I am strongly impressed from the little experience I had three years ago that repacking of these poor cargoes might be resorted to advantageously. Boys and girls can be hired to do the work at merely nominal wages and the only trouble is the loss of the poor and bruised fruit.

The SECRETARY.—I would like to ask you about early apples. Do you think it would be possible to get any of our early apples over ?

Mr. ALLAN.—Yes, certainly. I think the Duchess would go but it must be picked on the green side. You could scarcely try Red Astrachan. All early apples must be kept in a cool atmosphere. I do not see the slightest difficulty in taking those soft fruits across in a cold air compartment, and I believe we could get higher prices for those early fruits than we can expect for our winter varieties.

The SECRETARY.—Do you think it would be possible to get pears over to England ; Bartlett pears that are picked green ?

Mr. ALLAN.—I think there would be no difficulty in getting them over with the same vessel arrangements. As to how it would pay that would depend altogether on the state of the American crop. If the British and European crop was short it might be expected to pay well. I would not advise the shipment of our pears to the English market except under those circumstances.

Mr. DEMPSEY.—Does the pear crop often fail in the channel islands ?

Mr. ALLAN.—I do not think so. If we could educate the English taste up to appreciate the fine flavor of our pears we might do better, but they have not got to that point yet. They are coming to it gradually, however. They now eat our apples, while a few years ago they thought they were no good except for cooking.

HOW TO MAKE THE BEST OF TEN ACRES IN FRUIT CULTURE.

Mr. MORDEN.—The first requisite is the right man, and that man must have the qualifications of a solid business man. To make money in fruit growing requires business talent and it is a great mistake to imagine that a person lacking in business ability will ever make a successful fruit cultivator. Next to that business ability he requires a knowledge of the business he is engaged in. I will not dwell upon this, although it is a current idea among city people that every man is a born farmer and fruit grower. If you want to find a man who thinks he knows all about agriculture and fruit growing it will be necessary for you to go in search of him in the centre of some densely populated city. The men who have followed this business all their lives know very little about it. Although, as I have said, this is a very common idea it is a mistake. The fruit grower needs a practical knowledge of his business in addition to business qualifications. He also requires pluck and must be willing to work and fight weeds eight months of the year. He must hate weeds with an undying hatred and manifest that hatred every day of the week except Sunday. Having got the right man the next thing is to locate him in the right place. In the first place I would locate that man near some source of fertilisers. It is necessary to put him near some town or village of considerable size, because to get the best results out of ten acres requires no inconsiderable application of fertilisers. I would also have him

near a local market. It is rather a difficult thing to make a fortune out of growing fruit and shipping it exclusively to distant markets. I have myself a very deeply rooted aversion to wearing out my life in the behalf of express companies and carriers and commission men. Yet that is about the history of our business. The carrying companies and commission men have been making money fast and we have been getting very little. By being located near a local market we can very largely get rid of that trouble, but it is seldom that a local market alone is sufficient for us and it is therefore also desirable to be near a good shipping point, one at which there is competition, more than one way of reaching the outside market. From this point, for instance, you have as a rule only the steam-boat to connect you with Toronto. At the Falls we have a variety of ways: we commonly send our fruit into Toronto, just past your door, as cheap or even cheaper than you send yours at the present time. We ship very largely through St. Catharines and Port Dalhousie and we get it to Toronto just as cheap as the people of Port Dalhousie. Then we have as alternatives this route and the Great Western railway line. It is a great advantage to have a variety of ways of reaching the market. Now, having the right man in the right place, which is near some town or village, you must have for the next thing the right kind of soil, which is a very essential thing. It is quite possible in a small plot where the soil is not right to make it right, but it would be rather a large contract to undertake to make ten acres, not naturally adapted to the requirements of the fruit grower, suitable for them. I think it was Henry Ward Beecher who said he never respected a mountain so much as he did after he had attempted to make one, and I would not advise any one to try and make ten acres of hard clay or very poor sand or swamp into a fruit farm, because you have to compete with men who have suitable soils for the profit of the business, and to do so with any hope of success you must start on even terms with them. If you start with a bad soil the chances are that the business will be a failure as a matter of profit, and, as it is evident that the produce of ten acres of land in fruit culture would be more than a single family would consume it is as a matter of profit we are considering this question. Now we have the right man in the right place with the right soil and he goes to work. Another one thing is this, and in this I have failed though I generally try to practice what I preach: if you are not able to fertilise ten acres properly sell five and fertilise the other five. Fruit growing requires a great deal of manure, and it is my experience that a great many of the artificial fertilisers are a failure: indeed I have never yet been able to get ten dollars back from a ten dollar expenditure in that line. The preparation of ground for fruit culture is a different thing from preparing it for the ordinary crops. If you wished to secure a good ordinary farm crop of oats or barley you would probably not cultivate very deeply, but with fruit the ground requires to be more deeply and thoroughly worked because the fruit will occupy the same ground year after year, even in the case of strawberries probably two or three years, and I have never yet been able to turn in manure so deeply that these plants would not find it, so you need not be at all alarmed about cultivating too deeply. The soil should be very deeply cultivated and thoroughly worked, and all the weeds eradicated as far as possible before planting. In planting raspberries, gooseberries and currants, plant in squares so that you can cultivate cross-wise. Raspberries you put five to six feet asunder and about four feet in the row, so you can cultivate both ways. With gooseberries and currants you may plant closer, it will depend on the richness of the soil; but as far as possible get cross cultivation by which you will find the expense of cultivation very much reduced and the results will be better. In some cases of course you plant in rows. At the outset you can plant a vegetable crop between your gooseberries, currants and raspberries, or grapes. In grapes I am favorable to the idea of making the rows somewhat wider asunder, by which you can get through readily with a waggon with manure, and you can utilise the space between by getting a crop early in the season, because some vegetables will be allowable in the case we are speaking of now. In regard to the varieties of fruit to be planted that will depend very much on the kind of soil you have. If your soil is entirely sandy you cannot plant so largely of some varieties as you otherwise could. With a sandy soil my crop of currants would be less and my raspberries greater. One of the things that the possessor of ten acres would be very likely to plant at the outset is strawberries. I would not advise, however, that any one should do what I have frequently seen done, to

plant these with a row of grapes, because there would be a good deal of difficulty in taking the strawberries out later on. I do not fancy planting them in the rows. To make a success of planting strawberries the soil requires to be made very rich. Another crop is gooseberries. From currants I have been able to make almost as much per acre as from any other fruit I have ever grown. No matter how cold the weather you are almost sure of a crop of currants, although this year I have a very poor one; but we never get a total failure and generally get good crops when we give them careful attention and fight against the worms, which we must do. Just here I may say that I met with a difficulty this year. Hellebore has been the remedy all along, but the hellebore I got this year is so very mild that the currant worms will be killing the bushes next year. I have planted and grown raspberries very largely and make as much money with them as with any fruit. I plant so as to cultivate both ways and I use cultivation with knives. The sucker question is no matter of difficulty with me. I have been able to get very large returns from raspberries. I find that although you may get more strawberries to the acre, raspberries will give you ten or twelve cents a basket as readily as strawberries will six, and I have always realised readily with raspberries. One reason perhaps is that I compete with our American friends in their own markets. Nearly all the raspberries I grow are sold in the United States. In that I have the local market I have just been contending for, and in operating the local market I have followed the plan of taking orders from private families, which I can very readily do where I am known; and I get the retail prices and my baskets back. I have no baskets or crates lost or stolen. I can pick my berries at three o'clock in the afternoon and at six o'clock in the evening I am home with the money in my pocket. Blackberries can be sold at good prices and are grown with profit at a few points, but I would not recommend generally the culture of them even on this Niagara peninsula. I have never made a great success of them, but some men have, so it is not for me to say because I have failed with a certain fruit that no one else will make a success with it, and I find that other people in other places do succeed. Quinces can be grown on a ten acre plot; they can be planted closely, as I stated before, and other things can be grown between while they are young. I would grow plums also, especially if I had some clay. I have an immense crop on my trees and I never fail in having a crop of some kind, although mine is sandy soil on which we have to fight the curculio. I would also grow pears in a limited area like this. Plums, pears and quinces can be grown where your space is limited because by giving the care and cultivation I have spoken of a great deal can be accomplished in a small space where the land is rich. Now, in dealing with ten acres you must remember that you are to be confined to that area and you must not at once plant the entire area with fruit because the fruit must be renewed from time to time. One of the secrets of success in small fruit cultivation is the renewing of your cultivation very frequently; with raspberries and gooseberries perhaps once in seven years, and oftener in the case of strawberries, and it is always desirable to have some space reserved for that purpose which may be used otherwise in the meantime. Anyone who would succeed in the growing of small fruits must be prepared to do an immense amount of cultivation as compared with the ordinary farmer who puts in his crop of corn or potatoes and cultivates it once or twice. I find it necessary to cultivate my ground twelve or fifteen times a year, and to hoe nearly as often, though hoeing is not necessary so often, because if the ground is rich the shading of fruits will prevent the growth of weeds. We can keep weeds down very easily where the land is in thorough cultivation.

The SECRETARY.—Which would you rather have: ten acres of fruit planted and cultivated in the manner you have described or a hundred acres of ordinary farm without any fruit?

Mr. MORDEN.—Well, of late years farming has been rather a poor business and it would hardly be fair to make a comparison. It would be a mistake to think that you would get from ten acres of fruit the same profit as from one hundred acres of ordinary farm land with one-tenth of the expenditure, but in farming one hundred acres there is a considerable investment for implements and buildings, and it is difficult to get your interest out of it. If you bring that down to ten acres of course there are a great many

advantages. You may do with a less expenditure for buildings, etc., and there will probably be less hard, heavy labor, but you must not run away with the idea that you can do that without expense. The fertilisation, planting and caring for ten acres of fruit so as to get a profit is going to take considerable. I think it would be well in a hundred acre farm to devote ten acres to fruit; but if I lived ten or fifteen miles from any market I would be sorry to drop ninety acres of it and devote the remaining ten to fruit.

Mr. BILLUPS.—I have tried pyrethrum and have found it ahead of hellebore and it is not poisonous in any way as the hellebore is.

Mr. BUCKE.—Why do you not use Paris green?

Mr. MORDEN.—I use it early in the season. The currant worms make their appearance early in the season and sometimes I give them a little.

The SECRETARY.—I have very little trouble with the currant worm. I use the hellebore in the powder, shaking it on the bushes just when the currant worm first appears, which is quite early. We find him near the base of the bushes and I blow it down among them and give them a good dusting. Early in the year you have very little dusting to do and it is very effective.

CULTIVATION OF THE PEAR.

Mr. DEMPSEY.—It would not be possible for me at this late hour to go into any extended remarks upon the pear. As to its culture I would select for it first of all a soil a little on the clayey side and I would prefer a northern exposure, ascending slightly to the north. I find that our trees situated in that way are less liable to blight. They mature wood earlier in the fall and consequently they are more hardy. I grow some of my finest pears on what was formerly a brickyard. I have had people walk through it and pick up a little of the soil and say, "Oh, my! if I had a soil like this I could grow pears too." But it is one of the stiffest clays we have in any part of the country and the secret is it was always dry. We have heard considerable about blight taking our pears and apples. Now, I would simply endorse what we have heard to-night on that point and let it go just there. I am satisfied the blight comes first through the leaves and if neglected in a short time it becomes past cure.

Mr. McMICHAEL.—My experience as to a northern or southern exposure varies a little from Mr. Dempsey's; I should recommend as a result of my experience a southern rather than a northern exposure.

Mr. MORDEN.—I have succeeded with some pears in a soft soil, though I believe a hard soil is right. The specimens were not as good as those from a harder soil.

APPENDIX.

REPORT OF FRUIT COMMITTEE—SUMMER MEETING.

The Committee on Fruits report :

That they have examined the gooseberry Pearl and can recommend it as a most prolific bearer, and the samples exhibited show no indications of mildew and larger ones shown are a good sample, and are presumably a variety of the Whitesmith and well worthy of cultivation. We also have noticed the King Conn, which for appearance does not compare favorably with larger varieties, also a sample of the Industry, which is now become a favorite variety. We have also noticed some excellent samples of currants, the Fay and Versailles, &c. (Sent from Experimental Farm, Ottawa.) No. 369 is a berry of fine size, superior flavor and highly commented on. No. 169 is of fair flavor, medium sized, and worthy of cultivation. No. 175 is too long gathered to retain its flavor; seems very productive. No. 362 is a large berry, good flavor, will rank No. 1. The strawberry Pearl is a marvel for size and beauty, highly flavored and wonderfully productive, also some seedling strawberries. The sample No. 189 is productive and worthy of further trial. No. 307 is of good flavor and worthy of further trial.

THE ONTARIO FRUIT LIST.—APPLES.

The Committee on the Ontario Fruit List reported as follows :

Your two committees appointed at the last summer meeting at Seaforth to prepare catalogues of all fruit commonly grown in this province in such a manner as to show (1) a list of the varieties grown in the province; (2) lists showing the varieties best suited to the climate, elevation, soil, etc., for every district or locality, and (3) that any and all such lists be so prepared or constructed as to enable judges at competition exhibitions of fruits to intelligently estimate the true comparative value of any fruit on exhibition and thereby secure uniformity and fairness in judging fruit at all such exhibitions, beg leave to report:

That upon a careful consideration of the subject it was found that the duties of the two committees were so inextricably mixed as to make it necessary for them to work conjointly.

The catalogue of apples herewith submitted is therefore the work of your joint committee, and is the extent of their work to the present time. This report is therefore a report of progress.

The first decision arrived at by your joint committee was to leave out the headings usual in such a catalogue, such as Size, Color, Hardiness and Productiveness. The first two, Size and Color (to which might have been added Shape), are omitted because any such description to be of value should be sufficient for identification of a variety, but has not yet been done by our best pomological writers. The headings Hardiness and Productiveness are also omitted because they are applicable throughout the province to but a very few varieties, yet many of the varieties grown are both hardy and productive in many places.

You will observe that your Committees have adopted four general headings, viz:—Season, Quality, Commercial Value, and Total Value. Quality and Commercial Value are however sub-divided: quality into Dessert and Cooking, which embraces about all the properties of Quality; and Commercial Value into Home Market and Foreign Market, which gives the nearest approach we may make to the commercial value of any fruit.

The plan of rating adopted is to suppose all varieties to be perfect specimens. Then, the best varieties under each of these four heads are rated at 10 and all the more or less inferior varieties by some figure less than 10.

It frequently happens, however, even with the best varieties, that imperfect samples are exhibited. In such cases all values given in the catalogue must be reduced one or more points each for lack of color, under size, unevenness of size on plate, wormy, scabby or ill-shapen specimens, lacking stem or calyx, polished fruits *i. e.* having bloom wiped off, or for any other thing which tends to change the natural appearance of the fruit.

The column Total Value is for use when prizes are offered for fruit without designating the purpose for which such fruit may be required.

All of which is respectfully submitted.

Signed,

$$\left\{ \begin{array}{l} \text{THOS. BEALL, Chairman.} \\ \text{ALEX. McD. ALLAN,} \\ \text{P. L. DEMPSEY,} \\ \text{P. C. BUCKE.} \end{array} \right.$$

WINDSOR, 10th December, 1889.

This catalogue was sent to the Minister of Agriculture in July, 1890, accompanied by the following letter from the Secretary. From the Department printed copies were sent out to all Secretaries of Agricultural and Horticultural Societies in Ontario.

To the Honorable CHARLES DRURY, Minister of Agriculture :

SIR.—The Fruit Growers' Association of Ontario has had under consideration the subject of "How to attain greater uniformity and fairness in the awards of Prizes at Fairs." The great disparity in these awards has been a matter of public comment. This has been especially noticed in cases of collections of fruits where the rating of the values of the varieties has been left entirely to judges, some of whom are incompetent, and know very little of the comparative merits of the varieties placed before them. Even in cases of single plates, many of the judges employed are in a quandary as to whether an apple, for instance, should be classed among the fall or winter varieties.

The present system of appointing three judges in the fruit department of our Agricultural Fairs is also thought to be a mistake, for, even if one of the three is an expert, the final judgment will often be reversed in deference to the opinion of the other two.

Now, in order to secure uniformity and fairness in the awards and prizes for fruits at fairs, the first important consideration seems to be the appointment of fruit experts who will not award prizes for winter apples to autumn varieties, or allow one variety to pass for another because of their inability to identify them. If three expert judges cannot be had it appears to our Association that it would be far better to engage one expert, throwing upon him the whole responsibility and remunerating him accordingly, as is done in the judging at the poultry shows. Such a judge might also be required to give a list of points upon which his judgment in each case was based.

It is evident that the educational value of our fairs depends very largely upon the correctness of the judgments given, and it is therefore exceedingly desirable that the work of the judges should be based upon some one standard, for even experts will differ with regard to the value of the various kinds of fruits, and their judgments cannot therefore be expected to be uniform.

To aid the directors of the Agricultural and Horticultural Societies of Ontario in attaining so important an object as has been indicated above, the Ontario Fruit Growers' Association has undertaken the preparation of a Fruit Catalogue for the Province, beginning with the following one of apples, to which, in the near future, is to be added catalogues of other fruits prepared in a similar way.

The Catalogue is not intended in any respect to be a guide for planters, as this has been dealt with in other lists which will appear in the next annual report of the Association, and because fruits which might be of general excellence might be ill adapted to certain localities.

In order to the better understanding the Catalogue a few explanations will be necessary. It will be observed that the usual headings found in such a catalogue, such as "Size," "Color," "Hardiness" and "Productiveness," have been omitted, the first two because any such description to be of value should be sufficiently full and accurate to serve for the identification of the varieties, and the other two because there are very few varieties which are uniformly hardy and productive throughout the Province. Four general headings have been adopted, viz., "Season," "Quality," "Commercial Value" and "Total Value."

In the plan of rating, all varieties are supposed to be perfect specimens; then the best varieties under each of three or four heads are rated at ten, and all the more or less inferior varieties by some figure less than ten. It frequently happens, however, even with the best varieties, that imperfect samples are exhibited. In such cases all values given in the Catalogue must be reduced one or more points each, for (1) lack of color, (2) undersize, (3) unevenness of size on plate, (4) wormy, scabby or ill-shapen specimens, (5) lack of stem or calyx, (6) polished fruits, *i. e.*, having bloom wiped off, or for any other thing which tends to change the natural appearance of the fruit.

The column "Total Value" is for use when prizes are offered for fruits without designating the purpose for which such fruits may be required.

The committee to whom the preparation of this list was entrusted consisted of the following gentlemen, viz.: Messrs. Thomas Beall of Lindsay, Alexander McD. Allan of Goderich, P. C. Dempsey of Trenton, and P. E. Bucke of Ottawa, but before publication their work was submitted to a general meeting of the Association, where it was carefully amended and the desirability of its circulation among the secretaries of Agricultural and Horticultural Fairs agreed upon.

I am, Sir,
Your obedient servant,

LINUS WOOLVERTON,
Secretary.

GRIMSBY, July, 1890.

CATALOGUE OF APPLES FOR THE PURPOSE OF SECURING GREATER UNIFORMITY AND FAIRNESS
IN JUDGING AT EXHIBITIONS.

Name.	Season.	Quality.		Commercial value.		Total value.
		Dessert.	Cooking.	Home market.	Foreign market.	
Alexander.....	A	0	9	9	10	28
American Golden Russet.....	W	9	8	8	9	34
American Summer Pearmain.....	S	3	1	2	0	6
Arnold's Beauty.....	W	5	2	2	3	12
American Pippin.....	W	5	8	3	5	21
Adam's Pearmain.....	W	8	8	7	7	30
Autumn Strawberry.....	A	5	1	2	5	13
Bailey Sweet.....	W	2	8	1	3	14
Baldwin.....	W	2	5	7	8	22
Beauty of Kent.....	A	0	8	8	7	23
Ben Davis.....	W	0	1	8	9	19
Benoni.....	S	10	0	1	0	11
Belmont.....	W	3	6	4	6	19
Blenheim Pippin.....	W	6	7	9	10	32
Blue Pearmain.....	W	6	6	8	8	28
Bottle Greening.....	W	6	7	2	4	19
Bourassa.....	W	5	4	3	6	18
Cabashaw.....	W	2	7	8	9	26
Canada Baldwin.....	W	6	8	8	9	31
Canada Reinete.....	W	4	8	5	7	24
Cayuga Red Streak.....	A	2	8	7	8	25
Chenango Strawberry.....	A	8	3	7	0	18
Colvert.....	A	1	9	7	8	25
Cornish Gilliflower.....	W	1	0	1	2	4
Cox's Orange Pippin.....	A	9	3	7	10	29
Cranberry Pippin.....	W	7	8	8	8	31
Cellini.....	W	2	8	7	6	23
Domine.....	W	5	7	6	7	25
Drap d'Or.....	A	2	6	8	5	16
Detroit Black.....	A	0	4	2	4	10
Duchess of Oldenburgh.....	S	2	10	10	10	32
Dyer.....	A	7	5	3		
Early Harvest.....	S	9	3	9	0	21
Early Joe.....	S	8	3	3	0	14
Early Strawberry.....	S	8	2	7	0	17
Edgar's Red Streak.....	W	5	7	7	8	27
Ella.....	W	2	4	3	5	14
Eseopus Spitzenburg.....	W	9	7	9	10	35
Fallawator.....	W	7	8	8	9	32
Fall Janet.....	A	3	7	7	7	24
Fall Orange.....	A	4	7	6	3	20
Fall Pippin.....	A	6	8	7	7	28
Flushing Spitzenburg.....	W	6	6	6	7	25
Fameuse.....	A	9	5	9	8	31
Fall Queen (see Haas).....						
Gloria Mundi.....	W	0	8	6	8	22
Golden Russet (English).....	W	8	7	8	9	32
Golden Sweet.....	A	2	4	1	0	7
Grand Sultan.....	A	2	7	7		
Gravenstein.....	A	9	9	10	10	38
Green Newton Pippin.....	W	9	4	6	8	27
Grimes' Golden.....	W	9	2	6	7	24

NOTE.—In the first column the letter S denotes summer, A autumn and W winter.

CATALOGUE OF APPLES.—*Continued.*

Name.	Season.	Quality.		Commercial value.		Total. value.
		Dessert.	Cooking.	Home market.	Foreign market.	
Haas (see Fall Queen).	A	5	7	7	6	25
Hawley	S	6	5	5	0	16
Hawthornden	A	2	8	7	7	24
Holland Pippin	A	6	8	7	7	28
Hubbardston Nonsuch	W	7	8	8	8	31
Hurlbut	W	5	5	4	6	20
Irish Peach	S					
Jeffries	A	7	6	6	7	26
Jersey Sweeting	AA	1	3	1	0	5
Jonathan	W	9	7	7	8	31
Kentish Fillbasket	A	0	8	8	8	24
Keswick Codlin	A	1	9	6	7	23
King of Tompkins County	W	8	10	10	10	38
Lady	W	9	0	1	9	19
Late Strawberry	W	7	5	5	7	24
Lawyer	W	5	7	4	5	21
Lord Suffield	A	3	8	6	7	24
Lord Duncan	AA	2	9	7	6	24
London Pippin	W		8			
Lowell	AA	5	7	4		
Lord Burleigh	AA	2	9	5	0	16
La Rue	W	1	9	10	5	25
Maiden's Blush	A	3	7	7	8	25
Mam	W	4	7	6	8	25
Magog Red Streak	W	3	7	5	7	22
McIntosh Red	W	6	7	7	8	28
Melon	W	8	8	7	8	31
Minister	A	4	6	6	5	21
Monmouth Pippin	W	6	8	6	7	27
Mother	WA	8	7	6	6	27
Munson Sweet	A	1	3	2	0	6
Newton Spitzenburg	A	7	8	6	7	28
Northern Spy	W	8	10	10	10	38
Newton Pippin	W	9	9	7	10	35
Ontario	W	9	10	10	10	39
Peck's Pleasant	W	7	7	6	8	28
Pennock	W	5	7	7	8	27
Pewaukee	W	4	8	8	8	28
Peach	A					
Phœnix	W	4	7	7	8	26
Pomme Grise	W	9		5	7	21
Pomme Grise d'Or	W	10		6	8	24
Porter	A	5	4	5	3	17
Priestly	W	4	5	6	7	22
Primate	WS	7	6	6	0	19
Prenzea	SA	9	9	5	5	28
Princess Louise	WA	10	7	8	8	33
Pumpkin Sweet	WA	0	4	1	0	5
Pumpkin Russet	A	1	6	4	5	16
Pomme Royale (see Dyer)						
Rambo	A	5	1	2	5	13
Rawles Janet	W	4	5	3	5	17
Red Astrachan	S	5	7	8	0	20
Red Belle-fleur	SA	2	4	2	0	8
Red Canada	WA	6	6	7	8	27
Red Cathead	WA	6	8	7	7	28
Red Russet	WA	5	6	7	7	25
Red Bietigheimer	A					

CATALOGUE OF APPLES.—*Continued.*

Name.	Season.	Quality.		Commercial value.		Total value.
		Dessert	Cooking.	Home market.	Foreign market.	
Rhode Island Greening.....	W	8	10	8	8	34
Ribston Pippin.....	W	10	8	8	10	36
Roxbury Russet.....	W	6	8	8	9	31
Scarlet Pearmain.....	A	5	6	5	6	22
Shiawasse Beauty.....	A	7	6	6	0	19
Smith's Cider.....	W	1	4	0	1	6
Smokehouse.....	A	3	6	4	6	19
Sops of Wine.....	S	2	5	2	0	9
St. Lawrence.....	A	7	8	8	8	31
Stump.....	A	5	6	5	0	16
Summer Rose.....	S	6	6	4	0	16
Swaar.....	W	7	2	1	4	14
Swazie Pomme Grise (see Pomme Grise d'Or).....	W	2	2	7	8	19
Stark.....						
Snow (see Fameuse).....						
Talman Sweet.....	W	2	7	5	6	20
Tetofsky.....	W	1	5	1	0	7
Trenton.....	S	10	9	9	9	33
Twenty Ounce (see Cayuga Red Streak).....	A					
Vandevere.....	A	6	5	4	6	21
Wagener.....	W	8	7	6	7	28
Wallbridge (see Edgar's Red Streak).....						
Wealthy.....	W	8	6	9	9	32
Westfield Seek-no-Further.....	W	7	7	7	8	29
White Astrachan.....	S	1	2	1	0	4
William's Favorite.....	W	5	7	5	6	23
Wine Sap.....	W	7	0	1	3	11
Wine.....	W	7	7	8	8	30
Yellow Belle-fleur.....	W	8	7	5	5	25
Yellow Transparent.....	S	6	7	6	0	19

TWENTY-SECOND ANNUAL REPORT
OF THE
ENTOMOLOGICAL SOCIETY
OF ONTARIO.

1890.

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY.



TORONTO:
PRINTED BY WARWICK & SONS, 68 AND 70 FRONT STREET WEST,
1891.

TABLE OF CONTENTS.

PAGE.	PAGE.		
Agrotis clandestina.....	50	Beet fly	103
" ypsilon	50	" leaf miner.....	45
Anisopteryx pometaria	77	Bethune, Rev. C. J. S., articles by	
" vernata.....	77	4, 97, 98, 99	
Annual address of President	4	Birds, insectivorous	90
" meeting of Association of Economic Entomologists	37	Black-knot	8
" meeting of Entomological Society of Ontario.....	3	Blister-beetle, ash-coloured	48
" report of Council	11	Book notices	97
" statement of Treasurer	15	Bracon charus	70
Ant-hills and slugs	90	Braconidae	69
Anthomyia bete	103	Butterflies of Eastern United States	9
" brassice	45	" North America.....	9, 97
" radicum	45	" India, Burmah & Ceylon,	99
" raphani	44	" White Mountains.....	20
Apanteles militaris	53	Cabbage butterfly	48
Apidae	40, 46	" " parasite of	72
" PARASITES OF	71, 87	" insects	45, 48, 102
Apple, insects injurious to the	104	" plusia	49
Apple-tree borer, parasite of	70	Canker worms	34, 77
Aramigus Fulleri	62	Carrot fly	102
Arctia summa'ns	17	Caulfield, F. B., articles by	55, 73
Arctic f rns, origin and perpetuation of	59	Cave fauna of North America	97
Argynnis adiante	97	Cernotia forceps	34
" alecis	97	Cephus pygmaeus	91
" aphrodite	17, 97	Chalcididae	71
" ariet	97	Chalcis flavipes	71
" cipris	97	Chelymorpha argus	56
Army-worm, outbreak of, in Maryland	51	Chinch-bugs, destruction of	93
" parasites of	53, 67	Chionobas semidea	20, 60
Arsenites and honey-bees	89	Chortophila betarum	45
" experiments with	88	Cincinnella purpurea	17
Ashmead, W. H., article by	52	Cimbex Americana, parasite of	67
Asymmetry of head, etc, of thysanoptera	27	Clarkson, F., article by	19
Australian insects and fungus pests...	99	Coccinella novemnotata	19, 88
Bark beetles	75	Codling moth	99, 104
Bean louse	46	" parasites of	69, 70
" weevil	102	Cold, resistance to by caterpillar	90
Coleopterous larva, peculiar form of		Coleopterous larva, peculiar form of	28
Colorado potato-beetle		Colorado potato-beetle	46
Comstock, Prof. J. H., article by		Comstock, Prof. J. H., article by	91
Cook, Prof. A. J., article by		Cook, Prof. A. J., article by	22

PAGE.	PAGE.		
Coptocycla aurichalcea.....	57	Hadena amica	49
" clavata.....	56	" devastatrix	49
" guttata.....	56	Haltica striolata	48
Coreus tristis.....	7	Hargitt, Prof., article by	34
Cotton moth, parasites of.....	71, 72	Harrington, W. H., article by	64
Cryptine	66	Hessian fly	5, 25, 103, 105
Cryptus extrematis	67	Honey bees and arsenical spraying	89
Cucumber beetle	47	Hop aphis	103
Cut-worms.....	6, 43, 49	Hoplismenus morulus	66
Cynipidae	65	Hornet, habits of a	92
Daddy long-legs.....	103	Hybernia defoliaria	104
Danais archippus	20	Hylesinus opaculus	75
Davis, W. T., article by	92	Hymenoptera parasitica	64
Day in the woods	16	Hyphantria textor	7
Debis Portlandia	17	Ibalia maculipennis	65
Diabrotica vittata	47	Ichneumon grandis	66
Doryphora decem-lineata.....	46	Ichneumonidae	66
Downy mildew of grape	8	Infectious diseases of insects	35, 93
Dryobius sex-fasciatus	74	Isosoma hordei.....	72
Dularius brevilineus.....	74	Kitchen-garden pests	44
Economic Entomologists, Association of	37	Larch saw-fly	7
Election of officers.....	3, 15, 35, 40	Lema trilineata	47
Elm, insects injurious to the	73	Leucania unipuncta	51
Elm-tree borer	73, 74	Leucopsis affinis	71
Enemies of grain aphis.....	87	Macrobasis unicolor	48
Entomological Club of A.A.A.S.....	21	Macrocentrus delicatus	70
Ephestia kuhniella	10	Mallrophaga, development of	29
Ephialtes irritator.....	68	Manual of Injurious insects. Ormerod.....	101
Epirrita dilutata	77	Mediterranean flour moth	10
Eudryas grata	7	Moffat, J. A., articles by	51, 59
Eustrotia caduca	29	Monachamus confusor, parasite of	68
Evaniidae	66	" scutellatus, "	68
Fall web-worm	7	Mononychus vulpeculus, "	69
Flea beetle, the striped	48	Murtfeldt, Miss M. E., article by	30
Fletcher, J., articles by	21, 37, 62, 97, 101	Nematus erichsonii	7, 43
Foenus incertus	66	Neoclytus erythrocephalus	75
" tarsatorius	66	Neonympha canthus	17, 97
Fuller's Rose-beetle	62	Observations from box of White Mountain coach	19
Fyles, Rev. T.W., articles by	16, 44, 57, 78	Ecanthus niveus	75
Gall insects	65	Onion fly	44, 104
Garman, H., articles by	27, 87	Opheltes glaucopterus	67
Gelechia gallæ-diplopappi	18	Ophion bilineatum	67
Gilletto, Prof., article by	88	" macrurum	67
Gooseberry saw-fly	104	" purgatum	67
Grain aphis, enemies of	6, 87	Ophionine	67
Grapta comma	76	Organization of sections	21
" gracilis	17		
" interrogationis	75		
" progne	75		

PAGE.	PAGE.		
Ormerod, Miss, article by	105	Rhyssa persuasoria	68
Osborn, Prof., articles by	28, 29, 35	Russian parasite of Hessian fly	105
Oscinis	25, 42	Saperda discoidea, parasite of	68
Papilio Asterias, parasite of	66	" <i>lateralis</i>	74
Parasitic hymenoptera	64	" <i>tridentata</i>	73
Pear blight	104	Satyrodes Caanthus	17, 97
Pelecinus polyturator	72	Saw-fly borer in wheat	91
Phlaeotribus liminaris	75	Scudder, S. H., article by	99
Phorbia ceparum	44, 104	Semiotellus nigripes	105
Physonotus helianthi	55	Shakespeare, Entomology of	78
Pieris bryoniae	60	Sigalpus curculionis	70
" <i>rapae</i>	48, 72	Siphonophora avenae	6
Pimpla annulipes	69	Smicra Mariae	71
" <i>conquisitor</i>	69	Snow, Prof. F. H., article by	93
" <i>pedalis</i>	69	Spiders and their spinning-work, Mc- Cook	9, 98
" <i>pterelas</i>	69	Squash-bug	7
Pimplinae	68	Stem eel-worm	103
Plusia <i>aerea</i>	58	Stizus speciosus	92
" <i>aereoides</i>	58	Teaching Entomology	23
" <i>ampla</i>	57	Telea polyphemus, parasite of	67
" <i>balluca</i>	57	Tent caterpillars	7
" <i>bimaculata</i>	58	" " parasites of	67, 69
" <i>brassicæ</i>	49, 58	Tetrastichus esurus	72
" <i>falcifera</i>	58	Thalessa atrata	68
" <i>mappa</i>	58	" <i>lunator</i>	68
" <i>mortuorum</i>	57	Thecla Titus	17
" <i>precatonis</i>	58	Theronia fulvescens	69
" <i>Putnami</i>	57	" <i>melanocephala</i>	69
" Quebec representatives of genus	57	Thersilochus conotrichelii	67
" <i>simplex</i>	58	Thrips	103
" <i>thyatiroides</i>	57	Thyreodon morio	67
" <i>U-aureum</i>	58	Tiger beetles	17
" <i>viridisignata</i>	58	Tortoise beetles	55
Plum curculio, parasites of	39, 67, 70	Tremex Columba, parasite of	68
Plutella cruciferarum	42, 104	Trichogramma minutum	72
Potato beetle, Colorado	46	Trogus exesorius	66
" three-lined	47	Trypeta solidaginis	72
Preserving larvae, methods of	41	Tryphoninae	68
Pteromalus puparum	72	Vanessa Antiopa	75
Radish fly	44	Virginia Creeper moth	8
Rearing insects, experiences in	30	Wheat, insects affecting	25, 91, 103
Red spider	103	Wheat midge	103
Remedies for noxious insects	48, 102	White Mountain butterflies	20
Report of Council	11	Wire worms	103
Report of Delegate to Royal Society	13	Wood nymph moth	7
" Montreal Branch	14	Woolly aphis	104
Rhogas intermedius	70		

TWENTY-FIRST ANNUAL REPORT
OF THE
ENTOMOLOGICAL SOCIETY OF ONTARIO.

To the Honourable the Minister of Agriculture:

SIR,—In accordance with the provisions of our Act of incorporation, I beg to present herewith the twenty-first annual report of the Entomological Society of Ontario.

The report contains an account of the proceedings of our annual meeting for the election of officers and the transaction of the general business of the society, which was held in the city of London on the 27th of August, 1890; it includes also the audited financial statement of the Secretary-Treasurer, the reports of the Council and Montreal branch, the President's annual address, etc.

I have also the honour to submit with the foregoing, several illustrated papers contributed by our members on injurious and other insects, which have been specially prepared for the information of the public, and are intended to assist our farmers and fruit-growers in contending with their insect enemies.

The Society's monthly magazine, *The Canadian Entomologist*, has been regularly and promptly issued during the past year, and has just completed its twenty-second volume. It continues to receive contributions from all the most eminent Entomologists in North America, and to circulate in all parts of the world. During the past year it has been found necessary to issue more than twenty extra pages in order to find space for the many valuable articles which have been furnished the editor.

It is a matter of profound thankfulness that our province, during the past year, has escaped from any serious insect attack. Those that have been specially noticeable are referred in the President's address, or described in the papers that follow.

I have the honour to be, Sir,
Your obedient servant,

W. E. SAUNDERS,
Secretary.

ANNUAL MEETING OF THE SOCIETY.

The annual meeting of the Society was held in its own rooms in Victoria Hall, London, on Wednesday, August 27th, 1890. A Council meeting was held in the morning at 10 o'clock, at which the following members were present:—The President, Rev. C. J. S. Bethune, head master of Trinity College School, Port Hope; Mr. James Fletcher, Ottawa; Mr. J. A. Moffat, Hamilton; Rev. T. W. Fyles, Quebec; Messrs. J. M. Denton, W. E. Saunders and Dr. Woolverton, London. The annual report of the Council was discussed and adopted, and other routine business was transacted. The Secretary-Treasurer presented his annual financial statement of the receipts and disbursements during the past year. The Council reported the purchase of a large collection of insects from Mr. Johnson Pettit, of Grimsby, which was deposited in the rooms of the Society. The arrangements for the formation of sections in different departments of natural science were laid before the Society by the President, and, on motion, duly approved and ratified. A scheme was submitted for the rearrangement of the work of the officers of the Society, in accordance with which Mr. J. A. Moffat, of Hamilton, is to take entire charge of the rooms, library and collections, and be a permanent resident official in London. A number of tenders for printing *The Canadian Entomologist* were received and considered; no decision was made at the time, but subsequently it was resolved that the tender of the London Printing and Lithographing Company should be accepted. Certain regulations regarding the library and the use of the rooms were drawn up and adopted.

In order to benefit members of the Society it was resolved that for a limited time the volumes of *The Canadian Entomologist*, III. to XXI. inclusive, should be sold at 75 cents each; the annual reports for the following years: 1874, 1880, 1882 to 1889, at 25 cents each; and the new lists of labels for Coleoptera at 25 cents per set, in each case strictly to members only. Applications for these publications at the reduced rates should be made to the Secretary.

It was resolved to separate the offices of Secretary and Treasurer, which have hitherto been held by one person.

ELECTION OF OFFICERS.

The following gentlemen were elected officers for the ensuing year:—

President—Rev. C. J. S. Bethune, M.A., D.C.L., Port Hope.

Vice-President—James Fletcher, F.R.S.C., Ottawa.

Secretary—W. E. Saunders, London.

Treasurer—J. M. Denton, London.

Directors—Division 1—W. H. Harrington, Ottawa.

Division 2—J. D. Evans, Sudbury.

Division 3—Gamble Geddes, Toronto.

Division 4—A. W. Hanham, Hamilton.

Division 5—J. A. Moffat, London.

Librarian and Curator—J. A. Moffat, London.

Editor of the *Canadian Entomologist*—Rev. Dr. Bethune, Port Hope.

Editing Committee—W. E. Saunders, London; H. H. Lyman, Montreal; Rev. T. W. Fyles, South Quebec.

Delegate to the Royal Society of Canada—Rev. T. W. Fyles.

Auditors—J. H. Bowman, H. P. Bock, London.

After the completion of the necessary business of the Society, the rest of the afternoon was devoted to the examination of the books and collections of the Society, and the consideration of specimens brought by the members. Among these may be mentioned some live ant-lions (*Myrmelionidr*) brought from Indiana by Mr. Fletcher; a collection of *Plusias*, and other moths recently captured at Nepigon by Dr. Bethune, and some very interesting specimens of Lepidoptera, from the Province of Quebec, by Mr. Fyles.

The meeting adjourned at 6 p.m.

In the evening the Society held a public meeting in its rooms at 8 o'clock, which was largely attended by members and other friends from London and the neighbourhood. The Rev. Dr. Bethune, President of the Society, occupied the chair. After cordially welcoming those present, he proceeded to deliver the annual address upon the chief topics of interest in the Entomological world during the past year.

ANNUAL ADDRESS OF THE PRESIDENT.

LADIES AND GENTLEMEN.—Fifteen years have gone by since I last had the honour of addressing the members of the Society as its President. So long a period of time has naturally wrought great changes in our comparatively small circle of members, as well as in the world about us; but I am happy to see here to-night some who were with us at our annual meeting in 1875, and to know that many others have continued ever since their active interest in the welfare of the Society and the advancement of entomological science. For twelve years the presidential chair was most worthily filled by our highly esteemed friend, Prof. Wm. Saunders, who only resigned it in order to devote his whole time and energies to the great and important work which he has undertaken as director of the experimental farms of the Dominion. His great success in this new office is well known to all who take an intelligent interest in the prosperity of our country.

The removal of Prof. Saunders from an active share in the work of the Society seemed a very serious blow, and was certainly a very great loss, but happily we were able to find a worthy successor in the person of our excellent friend, Mr. James Fletcher, Dominion Entomologist and Botanist, who has so zealously performed the duties appertaining to the office of president during the last three years. With such able men at its head during so long a period of time, it may be readily understood how substantial was the progress of the Society, and how high was the reputation it achieved both at home and abroad.

The past year has been in some respects an eventful one in the history of the Society. In the month of April last I learned that Mr. Edmund Baynes Reed was about to leave this province and take charge of the meteorological station at Victoria, British Columbia. He was one of the original members, and for more than five and twenty years an active and zealous officer of the Society, filling at different times the positions of vice-president, secretary-treasurer, auditor, librarian and curator. To his energy it is due that we have obtained so large and valuable a collection of scientific books in our library; he also contributed many excellent papers to our annual reports, while discharging various other useful functions in the interests of the Society. His removal from amongst us was so serious a matter that I came up to London to make arrangements for the future management of our affairs, as well as to say good-bye to an old and very dear friend. After much consultation with Mr. Reed and other members of the council, we devised a plan for the general conduct of the business of the Society which has

been laid before you to-day, and which has resulted in the appointment of Mr. J. A. Moffat to the permanent charge of our rooms, library, collections, etc. It will be a great advantage, we are sure, in many ways, to have a qualified person to look after our possessions, and to be on hand at stated times for the admission of members to the rooms, as well as to discharge the other duties appertaining to the position to which he has been appointed.

While here in April last, a meeting of the local members of the society was held in order to consider a plan for the formation of sections which should include persons who took an interest in any department of Natural Science, and thus extend the operations of the society beyond the strict limits of entomology. The scheme which we agreed upon at that meeting was submitted to other members of the council for their approval, and has been fully ratified to-day. As its details have been laid before you already I need not repeat them here. It was very gratifying to learn that advantage was immediately taken of this arrangement, and within a few weeks active sections were formed with very satisfactory lists of members in the departments of Botany, Ornithology and Oology, Geology, and Microscopy. Many new workers have now joined our ranks, among whom we are glad to welcome a large contingent of ladies. A great impetus will thus be given, we trust, to the study of natural science in all its departments in London and the neighbourhood, and we hope that new life and zeal will be infused into the older as well as the later members by active co-operation in the field, the cabinet and the study.

Another matter upon which I may congratulate the society is the acquisition of the valuable collections of Coleoptera and other orders of insects, laboriously gathered together during many years by Mr. Johnson Pettit, an old and valued member of the society. Having ascertained that he was willing to part with his collections, I at once entered into correspondence with him, learned the sum for which he would be willing to transfer them to the society, and obtained the sanction of the members of the council for the purchase. Mr. Pettit was most reasonable in his terms when he understood the destination of the collections, and allowed us to have them at about half the price he would have asked from a private purchaser. Mr. Moffat did good service in the transaction by visiting Grimsby first to report upon the condition, quantity, etc., of the specimens, and subsequently by superintending their packing and removal to London. It is expected that during the coming winter he will be able in his capacity as curator to dispose of many of the duplicates by sale or exchange for the benefit of the society.

I may turn now from the consideration of our own concerns to matters Entomological affecting the country at large, and following the example of my predecessors in their presidential addresses, refer to the work of injurious insects in the garden, orchard and farm. The most important insect pest that requires the careful attention of our farmers is the well-known Hessian Fly (*Cecidomyia destructor*, Say) Fig. 1, which has made its unwelcome appearance in several parts of the Province. The attacks of this insect upon barley, rye, and wheat, are seldom noticed at first, as the creature is so minute and works out of sight, sucking the sap of the plant from the stem, but concealed from observation beneath the sheath of the leaf. Its depredations are usually made known by the breaking down and falling over of the plant caused by the injury to the stem produced by the insect. There are two attacks in the year, one in the autumn, when the maggots may be found embedded in the crown of the root shoots of fall wheat; the other in the summer, when it lies under the leaf-sheath above the first or second

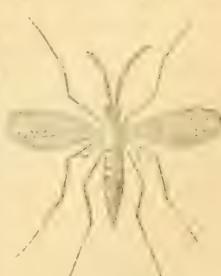


Fig. 1.

joint of the stem. When fully grown these larvae harden and turn brown, resembling "flax-seeds" in shape and colour, and in this stage are well-known to observant farmers. The tiny smoky-winged midges themselves, the parents of the destructive maggots, appear in April or May, and again in August, but are seldom noticed, except by entomologists, as they are so excessively minute, and require a lens for their identification. The eggs are scarlet in colour and are laid inside the leaves of the food plant. The most effective remedies for this pest are (1). The late sowing of fall wheat; if this is postponed till about the last week in September the winged Hessian fly is gone before the young plant is sufficiently matured to receive its eggs; (2) The careful burning of all screenings and other refuse from the threshing mill; this will ensure the destruction of large quantities of the insect in the "flax-seed" state. It is well to do this whether the Hessian fly is known to be present or not; (3) The burning of the stubble after the crop has been removed; but if this is not practicable, it is well that the field should be harrowed in order to cause any fallen grain to grow at once and make what is called a "volunteer crop." This will be attacked by the fly as a suitable place for the deposit of the autumn eggs, and the brood thus produced can be readily destroyed by a later plowing after the maggots are hatched out; (4) If a field is found to be infested, care should be taken to have such a rotation of crops that neither wheat, rye nor barley should be grown upon the same ground for at least another year; (5). Good cultivation and plenty of manure will produce a strong, healthy growth and enable many a plant to survive an attack that would be fatal to a less vigorous one.

I have trespassed upon your patience to mention these well-known remedies because the subject is of such vast importance, and constant iteration is required in order that our farmers may be made familiar with the methods of treatment that have been found most satisfactory. While much can be done to ward off the evil by an intelligent employment of these remedies, it is cheering to know that we do not entirely depend upon them for immunity, but that there are several minute parasitic insects which prey upon the Hessian-fly in its different stages, and in many instances prevent it from becoming a serious injury. During a recent visit to the central experimental farm at Ottawa, Mr. Fletcher showed me a number of plants of barley that were attacked by the Hessian-fly, but in nearly every one that we pulled up we found a parasitic insect closely associated with the enemy and evidently doing good work in its destruction.

Another insect that has been attacking grain in many parts of the Province is the Grain Aphid (*Siphonophora arenae*, Fab.) As everyone who is in the least degree observant must be familiar with the appearance and habits of plant-lice, it is unnecessary to enter into any description of this insect here; it will suffice to say that it is found of different colours, green, black, yellow or red, and that it attacks first the leaves of the plant and then the flowers and tender young grain, often causing very serious damage. This year it has appeared in many localities in Ontario, but it was at once attacked by its insect enemies, notably by the larvae and beetles of various species of "Lady birds" (*Coccinellidae*), the grubs of Syrphus flies, and the *Aphidius*—a four-winged parasitic fly. These natural enemies speedily reduced the numbers of the plant-lice and prevented their attack from becoming serious.

Cut-worms, the larvae of several species of night-flying moths, Fig. 2, (*Agrotis*, *Hadena*, *Mamestra*) have been abundant in all parts of the country, and especially injurious in gardens, but on the whole their attack has been much less serious than last year. This may perhaps be accounted for by the character of

the season; the frequent rains during the spring and early summer causing a

vigorous growth in the young plants and carrying them quickly beyond the reach of injury, while the wet weather would probably interfere greatly with the comfort of the Cut-worms and their ability to attack. The use of poisoned traps, as recommended by Mr. Fletcher in his address last year, has proved most effective wherever tried.

I may repeat that they consist of loose

bundles of weeds clover or any succulent vegetation, which are tied together and then dipped into a strong mixture of Paris green and water, and scattered over the land three or four days before the crop is planted out or appears above the ground.

The Tent-caterpillars (*Clisiocampa*) which are usually so abundant and so injurious to fruit trees in spring and early summer have been remarkable for their absence or rarity, in all parts of Ontario. We hope, however, that all fruit growers and gardeners will be on the look out for them next spring and consign the webs and their inmates to a speedy destruction.

The Fall web-worm, Fig. 3, (*Hyphantria tector*, Harris) has been exceedingly abundant in all parts of the Province that I have visited this year. I do not think that this insect causes much serious injury to the trees it infests, as it comes so late in the season when the leaves have to a large extent discharged their function as regards the growth and health of the tree, but it is a great eyesore with its unsightly webs, and should be got rid of by every tidy fruit-grower. Nothing is easier than to strip off the web and its living contents with the hands, or when out of reach, by means of a pole with a swab of any kind tied to the end.

The larch saw-fly (*Nematus Erisonii*), to which reference has been frequently made of late years, has not been nearly so abundant as usual in these parts of Ontario where it has hitherto prevailed. It is to be hoped that its natural enemies have multiplied to a sufficient extent to keep it in subjection and prevent its undue increase.

The squash-bug (*Coreus tristis*, De Geer), Fig. 4, has been very abundant and troublesome in many parts of Western Ontario this year. Where hand-picking and crushing under foot is impracticable, the insect may be readily destroyed by the application of a mixture of coal oil and sand, sprinkled over the stem and leaves nearest the root of the plant.

I have this year found a new insect enemy in the caterpillars of the beautiful wood-nymph moth (*Eudryas grata*, Fab.) Fig. 5 represents the caterpillar and moth. I have hitherto looked upon this lovely insect as an object of interest from its beauty and rarity, but this year

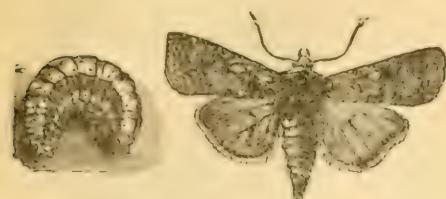


Fig. 2.



Fig. 3.



Fig. 4.

the caterpillars appeared in hundreds upon the Virginia creeper (*Ampelopsis quinquefolia*), which covers the front of our building at Port Hope with its graceful foliage. No attention was paid to these creatures at first, but it suddenly became apparent that they were rapidly devouring the leaves, and rendering most unsightly what was before a beautiful mass of green. They began their work near the ground and proceeded upwards, devouring the leaves as they went. On the 9th of August I had the infested creepers sprinkled with Paris green and water. One application sufficed to exterminate the insects, and none were afterwards to be seen. I have mentioned this instance particularly in order to bring before you the great advantage of using Paris green as a remedy for almost all leaf-eating insects—except, of course, those affecting cabbage and similar vegetables which are used as food. A judicious application of a very weak mixture will be found most efficacious. Proper care must, of course, be exercised when dealing with so virulent a poison. Its use as a remedy for the apple codling-worm and the plum curculio has now been fully demonstrated, and any fruit grower who will carefully follow out the directions published in our annual reports will, we are confident, be amply rewarded. It is a subject of no little gratification to us that fruit-growers in England have been at last persuaded to try this remedy, and in every instance that we have heard of the experiment has been crowned with success. It required two or three years of persistent effort on the part of Miss Ormerod aided by Mr. Fletcher to overcome the insular prejudice against adopting anything new and seemingly dangerous. Now that a beginning has been made, we hope for great results in the immediate future.

Before leaving this practical portion of my address, I wish to refer to a kindred, though not an entomological matter. I have noticed in many parts of Ontario an alarming increase of the fungus growth on plum and other fruit trees, commonly called the "black knot." An Act was passed by the Ontario Legislature a few years ago ordering the cutting down and burning of all infested trees, and imposing penalties for neglecting to do so; but the law seems to be a dead letter and no one apparently dreams of enforcing it. It would be well for our municipal councils to instruct their path-masters and other officials to look after the black-knot and enforce the law wherever its provisions are neglected. If this is not done there will soon be no cherry or plum trees left in the country, as the disease rapidly spreads, and when once it attacks a tree it is almost hopeless to attempt a cure.

Another fungus disease to which I may call your attention is the "downy mildew" of the grape. It is exceedingly injurious and very prevalent. Fortunately it may be readily checked by the use of the "Bordeaux mixture," and other compounds which fruit-growers have employed with great success.

Turning now to what I may call the non-economic aspect of entomology—though all investigations into the habits and distribution of insects have their practical bearing at some time or other—it is worthy of remark that butterflies have been extraordinarily scarce in Eastern Ontario this year. Whole days spent in collecting in localities where they were usually abundant have resulted in the capture of nothing worthy of mention. It is possible that the unwonted mildness of the winter, with its frequent changes from freezing to thawing, and the absence of snow, may have occasioned a great destruction among the hibernating

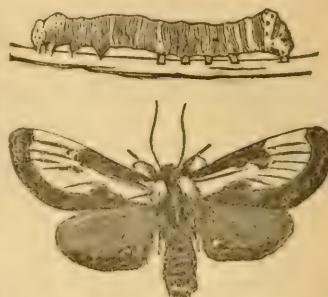


FIG. 5.

forms of diurnal lepidoptera. I am the more inclined to give credit to this cause, as I found recently at Nepigon and Port Arthur, where the winter was quite as severe and prolonged as usual, butterflies were remarkably abundant, and could be found in hundreds whenever the sun was shining. Among other interesting captures at Nepigon, which has now become a famous hunting-ground, and where the butterfly collector, careering in hot haste with net in hand after a specimen, is not regarded as an escaped lunatic, as he would be in most parts of the country, but as a scientist engaged in quite as praiseworthy an occupation as trout-fishing—among my captures I may mention a number of specimens of *Plusia* belonging to several different species. As I only returned a few days ago I have not had time to get them identified, but I have brought several of them here for inspection. They were very active indeed upon the flowers of thistles and golden rod, flitting swiftly from one to another in the hot sun.

Since our last annual meeting many important additions have been made to entomological literature. Mr. Scudder's grand work on "The Butterflies of the Eastern United States and Canada" was completed last September. It forms three large volumes, containing 2,000 pages and nearly a hundred plates and maps, about forty of which are coloured. It is truly a magnificent work and a monument of patient labor and careful scientific investigation. However much we may differ from the author on such vexed questions as generic nomenclature, the sequence of families, and the like, we must express our unbounded admiration for his ability and learning, and the excellence of his work. The long pages of descriptive matter are enlivened by essays on all manner of subjects connected with butterfly life, written in a particularly charming style, and to each chapter is prefixed a stanza or two of poetry, so apt and so beautiful, that one is lost in wonder at the diversity and extent of the author's acquaintance with literature. This feature of the work renders it available for all lovers of natural history, even though they may take no special interest in butterflies. The author has published the work at a large pecuniary sacrifice. The list of subscribers is strangely small, but we hope that ere long librarians everywhere will find out that without a copy of Scudder's butterflies their collection of books is very incomplete.

Self-sacrifice in the publication of entomological literature is the order of the day. A similar tale has to be told of the authors of the next two books that I wish to refer to. Mr. W. H. Edwards continues to issue his lovely illustrations of the "Butterflies of North America." The coloured figures of these insects in all their stages are the most perfect and the most beautifully executed that I have ever seen. Nine parts of the third series have now been issued, and the tenth is almost ready; but at what a cost to the author! In order to accomplish this stupendous work he has been obliged to dispose of his collections and nearly all his books—a sacrifice that would be heart-breaking to most of us.

The other work to which I referred is the Rev. Dr. McCook's "American Spiders and their Spinning Work," the second volume of which has just been issued. When complete the work will consist of three large quarto volumes, profusely illustrated with wood cuts and some coloured lithographic plates. It is written in a most interesting manner, and while thoroughly scientific, is so popularly and clearly expressed that it may be read with ease and delight by any one who cares to learn about the strange habits and peculiar life-history of these singular creatures. When finished it will certainly be the most complete and perfect work on spiders in the English language. In this case, too, the author is publishing at his own expense and does not expect to be reimbursed for his

outlay. All these works, I am glad to say, will be found in our Society's library and are available for the use of the members.

Serial publications on North American entomology continue to be represented by the *Transactions of the American Entomological Society*, Philadelphia; *Psyche*, Cambridge, Mass.; *Entomologica Americana*, Brooklyn, N. Y.; *Insect Life*, Washington, D.C., and our own *Canadian Entomologist*. Another addition has been made to the list this year by the issue of *Entomological News and Proceedings of the Entomological Section of the Academy of Natural Sciences of Philadelphia*. The working entomologist can hardly do without any of these publications; each one occupies its own special field, and all are valuable and interesting. Our own magazine, now in its twenty-second volume, continues to be issued with regularity, and, I am happy to say, receives contributions from all the most eminent entomologists in North America, and occasionally from others in Europe.

The study of economic entomology has been making vast strides during the last few years, owing to the establishment of experimental agricultural stations in all the States of the Union, and the appointment in many of them of a skilled entomologist. The bulletins issued from these stations and the central department at Washington are too numerous to mention in detail; they are replete with useful information and interesting records of experiments and observations. That the work is eminently scientific is shown by the names of those employed, for instance, Dr. Riley, Mr. Howard, Dr. Lintner, Professors Forbes, Cook, Smith, Fernald, Webster, Weed. These names, and many others, are familiar to us all as men of distinction in their several localities and departments.

In our own country much valuable work is being done by Mr. Fletcher, the Dominion Entomologist at Ottawa, not only by his investigations and the published results, but also by the addresses which he gives in different places to the meetings of Farmers' Institutes. He is in this way diffusing throughout the country a knowledge of friends and foes amongst insects, and the best modes of encouraging the former and exterminating the latter. The result of his work must in course of time be the saving of hundreds of thousands of dollars to the farmers and fruit-growers of the Dominion.

In England Miss Ormerod continues her unselfish devotion to the cause of economic entomology. Her annual reports are full of very valuable information, and have done much good in the mother land. It is gratifying to find that this department of practical work is being developed also in other parts of the British Empire. We have received a useful report on insect and fungus pests from the Department of Agriculture at Brisbane, Australia, prepared by Mr. Henry Tryon, of the Queensland museum, and several numbers of *Indian Museum Notes*, published at Calcutta by the Government of India Revenue and Agricultural Department. These "Notes" are edited by Mr. E. C. Cotes, and contain a large number of most interesting and valuable papers, both scientific and practical, illustrated with excellent engravings.

Before leaving this subject, I must not omit to mention the publication last autumn of a bulletin on the "Mediterranean Flour-Moth" (*Ephestia Kuhniella*, Zeller), prepared by Dr. Bryce, of Toronto, and issued by the Agricultural Department of Ontario. It is an excellent pamphlet and contains just what one wants to know about this new pest. The mischief referred to seems to have been stamped out, at least I have not heard of any further cases of attack in this province, and we may be quite certain that after the experience of last year, our millers will keep a sharp look out for the pest, and deal with it promptly should it show itself again.

I feel now that I have trespassed quite long enough upon your patience, and must bring my remarks to a close. The prospects of our Society are bright and cheering; we may well congratulate ourselves upon what has been accomplished in the past, and look forward with pleasant anticipations to the future. Let each member work honestly and faithfully in his own special department, and let us all unite in upholding the interests of the Society, and doing all that we can to increase its usefulness, maintain its reputation and ensure its success.

After a cordial vote of thanks to the President for his interesting address had been duly moved and seconded, Mr. Fletcher was called upon to give an account of the meeting at Indianapolis of the Entomological Club of the American Association for the Advancement of Science, to which he had been sent as delegate by the Society, and from attending which he had just returned. Mr. Fletcher stated that it had been an exceptionally good meeting, attended by a larger number than usual of eminent entomologists and botanists, and that its discussions were remarkably interesting and useful. The full account of its proceedings will be found in a subsequent part of this report.

The Rev. T. W. Fyles read a scholarly paper, entitled, "A Day in the Woods," which was highly appreciated by the audience.

The reports of the Council, the Montreal Branch, and the delegate to the Royal Society were read by the President.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario beg to present the following report of their proceedings during the past year:—

The Society, they are happy to say, continues to prosper and maintain its usefulness. The membership is satisfactory and increased interest is being taken in its work.

The twentieth annual report on Economic and General Entomology was sent to the Minister of Agriculture in December last, and was printed and distributed in the following May. As it has been for some time in the hands of the members of the Society, it is unnecessary to refer particularly to it. It consisted of 104 pages, with 50 wood cuts in illustration, and was quite up to the average in the papers which it contained.

The *Canadian Entomologist* has been regularly issued at the beginning of each month, and is now approaching the completion of its 22nd volume. It continues to receive valuable contributions from all the leading entomologists in North America, as well as from some in Europe, and is regarded by scientists as a highly important magazine in the department which it occupies. The editor has found it necessary on two occasions recently to enlarge the number of pages from 20 to 24 in May and 28 in August, owing to the pressure upon his space.

After the disastrous fire at the University of Toronto in February last, the Council decided to present to the library a complete set of the *Canadian Entomologist* and the annual reports.

Several valuable additions have been made to the library of the Society during the past year, among which may be mentioned Mr. S. H. Scudder's "But-

terflies of the New England States and Canada," which is now completed and bound, and the Rev. Dr. McCook's "Spiders and their Spinning-work," two volumes of which have thus far been issued.

In April last a meeting of the Society was held in London, with the president in the chair, at which plans were discussed for the formation of sections of the Society in other departments of natural science. The memorandum agreed upon at the time is herewith submitted for approval and ratification.

In consequence of the removal of Mr. E. Baynes Reed from London to British Columbia, to take charge of the Dominion Meteorological Station at Victoria, it will be necessary to make some new arrangements for the care of the library and collections, and the performance of the official work of the Society. The Council will submit a scheme for the appointment of a permanent officer in the person of Mr. J. Alston Moffat, of Hamilton, which they trust will be found to work satisfactorily, and to increase the usefulness and prosperity of the Society.

The Council desire to place on record their feeling of deep regret at the removal of Mr. Reed from this Province and the loss which the Society thereby sustains. Mr. Reed is one of the original members of the Society, and for more than a quarter of a century has been one of the most active and zealous of its officials, filling at different times the positions of vice-president, secretary-treasurer, librarian, curator and auditor. To him it is especially due that the library has grown to its present dimensions and value, and that so much progress has been made by the Society in many directions. The Council beg to thank Mr. Reed for his services in the past, and wish him all possible success and prosperity in his new and important sphere of labour.

During the month of May last arrangements were entered into for the purchase of the large collections in Coleoptera and other orders of insects made by Mr. Johnson Pettit, of Grimsby. The packing and transportation were superintended by Mr. Moffat, and the collections are now safely deposited in the rooms of the Society.

In accordance with our long-established custom, a member of the Council, Mr. Fletcher, has attended, as representative of the Society, the meeting of the Entomological Club of the American Association for the Advancement of Science, which has just been held at Indianapolis, Ind. Mr. Fletcher will submit a report of its proceedings.

The report of Mr. Lyman, the delegate to the Royal Society of Canada, and the report of the Montreal Branch, are presented herewith. The accounts of the secretary-treasurer have been duly audited, and will be laid before the Society.

Tenders for printing the *Canadian Entomologist* have been procured from several printing offices in London and Toronto, and are now laid before the Society for consideration.

Respectfully submitted on behalf of the Council.

CHARLES J. S. BETHUNE,
President.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO
THE ROYAL SOCIETY OF CANADA.

BY H. H. LYMAN, DELEGATE.

As delegate from the Entomological Society of Ontario, it is again for the third time my duty to submit a short report of the work and progress of the Society during the past year, and I have much pleasure in saying that the Society continues to prosper and to maintain its high position among the scientific institutions of the Dominion and the continent.

The monthly magazine of the Society, the *Canadian Entomologist*, has been regularly and promptly issued during the past year and fully maintains its well known high character. The volume for 1889, which was the twenty-first volume, contained the usual 249 pages of reading matter, and had also one plate. The contributors numbered thirty-four and the articles were quite up to the usual standard of interest. One new genus thirteen new species and seven new varieties of various orders were described in the volume, which also contained the complete life-histories of four species and partial ones of eight others. A series of papers on popular and economic entomology were also published during the year.

The annual report of the Society for 1889 to the Minister of Agriculture for Ontario has been published and contains many interesting papers of much importance to agriculturists, besides the usual report of the annual meeting and of the finances of the Society.

The annual meeting of the Society was held in Toronto on September 3rd, during the meeting in that city of the American Association for the Advancement of Science, which afforded our members the pleasure of meeting some of the distinguished entomologists of the neighbouring republic whose presence also added much interest to the meeting of our Society.

Our members also enjoyed the pleasure of attending the meetings of the Entomological Club of the American Association, presided over by our then President, Mr. Fletcher.

During the progress of these meetings it was resolved to form an "Association of Official Economic Entomologists" for the United States and Canada, which was accordingly organized and officers duly elected.

This movement is likely to have a very beneficial effect in securing greater co-operation among entomologists in official positions, and the annual meetings with the interchange of members' views cannot fail to be productive of much good. The library of our Society is in excellent order and was reported at the annual meeting as containing 1,052 volumes.

On account of certain provisions of "The Agriculture and Arts Act" of Ontario, recently passed, it was found necessary to make certain changes in the council of the Society, as the Act provides that all societies which receive aid from the Ontario Government must be governed by a board of directors who are residents of the agricultural divisions which they represent, the Entomological Society being permitted to group the thirteen agricultural divisions into five with one director for each. This Act will of course prevent any member of the Society residing out of Ontario holding any of the more important positions in the gift of the Society.

The following officers for the ensuing year were duly elected:

President—Rev. C. J. S. Bethune, M.A., D.C.L., Port Hope.

Vice-President—E. Baynes Reed, London.

Secretary-Treasurer—W. E. Saunders, London.

Librarian—E. Baynes Reed, London.

Curator—Rowland Hill, London.

Directors, Division 1—W. H. Harrington, Ottawa.

“ 2—J. D. Evans, Sudbury.

“ 3—Gamble Geddes, Toronto.

“ 4—J. Alston Moffat, Hamilton.

“ 5—J. M. Denton, London.

Editor of the *Canadian Entomologist*—Rev. Dr. Bethune, Port Hope.

Editing Committee—James Fletcher, Ottawa; J. M. Denton, London; Rev. T. W. Fyles, South Quebec; Dr. Brodie, Toronto.

Delegate to the Royal Society of Canada—H. H. Lyman, Montreal.

Auditors—J. M. Denton and E. B. Reed, London.

Early last month our Society, on the suggestion of the President, resolved to extend its field of operations by permitting the formation of sections for the study of other branches of Natural History, and sections have already been formed in Botany, Ornithology, Geology, and Microscopy, and joint field meetings of all the sections will be held regularly during the summer. This movement will, it is anticipated, strengthen the Society by bringing in many additional members. It is also hoped that arrangements may be effected to keep the rooms of the Society open daily.

The Montreal Branch, of which I have the honour to be President, continues I am happy to say in a prosperous condition. A number of new members have joined during the past year, and the monthly meetings have been regularly held and have been usually well attended.

Mr. Scudder's magnificent work on the Butterflies of New England, to which reference was made last year, was completed last October, and its issue marks an epoch in the history of North American Entomology.

The placing by Parliament during the past session, of books which have been published for twenty or more years upon the free list, is a measure of great importance to entomologists, as it removes a very burdensome tax upon men whose studies are seldom remunerative in a pecuniary sense, and will tend to encourage the bringing into the country of many valuable works upon this science which would not otherwise have been done.

REPORT OF THE MONTREAL BRANCH.

The seventeenth annual meeting of the Montreal Branch was held at the residence of Mr. Lyman on May 23rd, 1890, at 8 o'clock, p.m.

The following report of the Council was then submitted by the President:

SEVENTEENTH ANNUAL REPORT OF THE MONTREAL BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Council in presenting their report for the year 1889-90, can state with pleasure that the past year has been one of progress for the Branch, no less than six new members having been elected during the year.

The names of those added to our roll are Messrs. Chas. Jackson, P. M. Dawson, E. F. Baynes, Alfred Griffin, G. M. Edwards, and W. C. Adams; but of these Mr. Dawson has recently left Montreal to pursue his studies elsewhere.

During the year ten meetings have been held, one of which, viz.: that in June, held at the residence of Mr. Trenholme, in Cote St. Antoine, was primarily devoted to collecting nocturnal lepidoptera.

The following papers were read during the year:—

1. The North American Callimorphas; A Reply to Critics. H. H. Lyman.
2. Some Insects injurious to the Oak; F. B. Caulfield.
3. Notes on the Lepidoptera of Little Metis, P. Que. A. F. Winn.
3. A Trip to Mount Mansfield. H. H. Lyman.
5. Note on the Occurrence of *Erebia Discoidalis* at Sudbury, Ont. H. H. Lyman.
6. Notes on some species of Coccinellidae found at Montreal. F. B. Caulfield.
7. Entomology of Pittsfield, Mass. P. M. Dawson.
8. Note on the occurrence of *Lepisesis flavofasciata* at Ormstown, P. Que. H. H. Lyman.
9. Various notes on Coleoptera. J. F. Hausen.

Comparatively little field work was done during the collecting season of 1889, owing to the unusual scarcity of insects of those orders studied by the members, and though the prospects for this season are not as yet very encouraging, we may hope that more will be done, especially with the increased membership of the Branch; and it must also be remembered that even in an unfavourable season good work may be done in discovering the preparatory stages and foodplants of insects where these are unknown, or only partially known, as was the case last season in regard to *Graptia J. album*, which was bred by two of our members.

Submitted on behalf of the Council.

(Signed) H. H. LYMAN, President.

The Secretary-Treasurer then submitted the financial statement, shewing a balance on hand of \$8.77.

The reports having been adopted, the following officers were elected for the ensuing year:—President, H. H. Lyman; Vice-President, F. B. Caulfield; Secretary-Treasurer, A. F. Winn; Council, E. C. Trenholme and J. F. Hausen.

The President then read an interesting paper, "Notes on *Argynnis freya* A. Charilea, and *H. Montinus*," dealing with the differences between these species and illustrating them by specimens.

(Signed) E. C. TRENHOLME,
Sec.-Treasurer.

ANNUAL STATEMENT OF THE TREASURER.

Receipts, 1889-90.

Membership fees.....	\$229 53
Sales of <i>Entomologist</i>	110 89
" pins, cork, etc.....	144 51
Advertisements.....	13 1
Government grant.....	1,000 00
Interest.....	10 08
Balance from last year.....	121 73
	<hr/>
	\$1,629 96

Expenditure, 1889-90.

Printing.....	\$431 75
Report and meeting expenses.....	154 15
Library.....	57 26
Purchase of collections, etc.....	318 52
Expense account (postage, stationery, etc).....	91 69
Rent.....	80 00
Insurance.....	35 00
Grants to Editor, Secretary and Librarian.....	200 00
Cork, pins, etc.....	107 69
Balance.....	153 90
	<hr/>
	\$1,629 96

The President read the memorandum which was drawn up in April last regarding the formation of sections of the Society in various departments of natural science, and after giving an account of the enthusiasm with which the project was taken up by the naturalists in London, he congratulated the members on the success of the movement and hoped that it would long continue.

A paper by Mr. Frederick Clarkson, of New York, entitled "Observations from the top of a White Mountain coach," concluded the formal part of the meeting, and was listened to with much interest. At the request of those present, Dr. Bethune gave an entertaining account of the admirable work of Miss Eleanor A. Ormerod, the foremost economic entomologist of Great Britain, including pleasant reminiscences of his personal acquaintance with her.

The meeting then proceeded to discuss the locality and arrangements for an outing the next day, and decided upon visiting the banks of the River Thames a few miles below the city, where there is an excellent collecting ground.

Mr. Dearness, Mr. W. E. Saunders and Dr. Woolverton were next called upon to give a report of the proceedings in the botanical, ornithological and geological sections respectively; their remarks were highly interesting and encouraging, and proved that the new departure made by the Society is an excellent one and must greatly redound to its success and prosperity.

After some congratulatory remarks by the President upon the admirable showing of the Society for the past year, the meeting adjourned.

A DAY IN THE WOODS.

BY THE REV. THOMAS W. FYLES, SOUTH QUEBEC.

A day in the woods! What delightful reminiscences do the words awaken—recollections of bird-nesting and nutting expeditions, and of

"The days when we went gipsying a long time ago."

To the busy man, who loves business for itself, a day of relaxation can hardly be unwelcome; but to the man who leads a busy life, not from choice, but from stress of circumstances and for whom the wilderness and the solitary place have especial charms, how delightful is it to escape from his accustomed haunts, and "far from the madding crowd's ignoble strife," to look into the fair face of Nature, and to listen with loving reverence whilst she tells of many things.

It was with something akin to the feelings of such a man that on the 6th day of August last, I proposed to the young people at my house that we should have a day in the woods. The proposition was joyfully welcomed, a party was soon made up, the horse was harnessed, lunch baskets were packed, tin-pails for berrying were stowed away and forthwith we started. We drove along the cliff road to St. David's and then took a by-road leading to St. Henri's. Soon we came to a region of sand. Wherever the turf was cut by the wagon-wheels sand appeared. With change of soil, a change of flora and fauna may be expected. The first thing that took my attention was the multitude of tiger beetles frequenting this green lane. A sandy tract in which ant-hills are numerous is the favorite hunting ground of the cicindelidae, and in such a tract the mining operations of their larvæ may be easily carried on. Amongst the beetles that I noticed on this occasion, was the blue-black cicindela with the yellow clypeus

(*C. longilabris* Say), the rich rosy-purple (*C. purpurea*, Oliv.), (Fig. 6), and the deep bronzed-green (*C. limbalis* Kl.). My efforts to capture some of these aroused the curiosity of some *habitants* who were working in an adjacent field. At first they looked with the utmost astonishment at my proceedings, and shook their heads at one another as much as to say, *He is very far gone*; but soon a light seemed to dawn in upon them and there was a general clearing up, they came, in fact, to the conclusion that I and my party were bound on a fishing excursion to the Falls of the Etchemin, and that I was prudently laying in a supply of grasshoppers for bait. And shortly afterwards, when I had occasion to speak to them, I received respectful greeting and attention as one who *knew what he was about*. Resuming our

journey we came to a region of second growth balsams, broken in upon by poorly cultivated fields in which blue-berry bushes abounded, and by tufts of green velvety moss dotted over with young pines. As we entered this region the passage of our vehicle disturbed a butterfly. "There goes *Neonympha euraphia*," I said, but in a moment the thoughts of the incongruities of time and place for this induced me to leave my wagon and go in search of the insect, and soon I had the great delight of securing for the first time, a living specimen of *Debis Portlandia*. Gosc took this species many years ago at Compton, P. Que., and D'Ullan in Argentenil county, on the River Rouge. It has since been taken by Mr. Caulfield and Mr. Winn on Mount Royal, and by Mr. Fl-tcher in the neighbourhood of Ottawa. The insect is, however, rare in the Province of Quebec. In the course of a few hours I took two others specimens, dilapidated females. I found that the ovary of one of these had been quite emptied, from the other I obtained by pressure five pearly-white eggs, large for the size of the insect.

I did not find *D. Portlandia* difficult to catch. It has the habit of flying for a few rods, and then settling on the trunk of a tree a yard or two from the ground, trusting it would seem for security to the similarity of its colours to those of the lichens that cling about the balsam stems.

In the glades and open fields *Argynnis Aphrodite* and *Argynnis Atlantis* were everywhere abundant, the latter being readily distinguished by their dusky beauty from their brighter companions. Whilst I was watching these active fritillaries, a butterfly of a different form came into the field. It proved to be *Graptia gracilis*. It was the only one of its kind that I could discover. Another good butterfly that I took on this occasion was *Thecla Titus*. This insect appears to be very widely distributed in Quebec Province. I have found it on Mount Royal, at Oka on the Ottawa, in the Eastern Townships and at Quebec, but solitary, or in pairs only.

Amongst the moths that showed themselves on this occasion, I noticed two very perfect specimens of that showy insect *Arctia Saundersii*, (Fig. 7), also the beautiful *Plusias*, *Simplex* and *Precationis*. On the trunks of the trees *Pretophora truncata* was to be seen, and, of course, that ubiquitous insect *Drasteria erecthea* (Cram.) was constantly rising from the grass at my approach. The hour for luncheon having arrived, and my boy having kindled a fire and made the tea, the fruit gatherers were summoned and soon appeared laden with their spoils, raspberries, blueberries and the fruit of *Amelanchier Canadensis* (Torr. and Gr.), called by the French-Canadians *poires*. We sat down under a spreading beech, and amidst such



FIG. 6.



FIG. 7.

a beating of drums as the Queen of England holding high festival in Windsor Castle never heard, for it seemed as if from every tree *Cicada canicularis* was sounding its note. The tattoo of this insect increases in intensity for a while and then breaks off with a few disjointed beats. Now and then a sudden whir-r-r would be heard and the dark body of the bug would be seen shooting like a bolt to fresh vantage ground, the transparent wings of the insect being invisible against the blue sky.

After luncheon the most interesting discovery that I made was that of a species of Gelechia inhabiting galls on the white aster (*Diplopappus umbellatus* Torrey and Gray). The galls were found well up the stems of the plant, from a foot to two feet above the ground, and were smooth and onion-shaped. The largest specimens were five-eighths of an inch across. On opening the galls I found in several a brown chrysalis resting upon a web stretched across the interior. At the bottom was some decomposed matter, and near the top a neat round hole bitten through to the outer skin of the gall. In others of the galls I found a number of white shining grubs, blunt at one end and tapering at the other. Their length was about one line. I counted ten of these in one gall, and they were evidently consuming the remains of their host. In some instances the grubs had spun up into light drab cocoons.

In a few days I obtained from the galls four moths and two ichneumon flies. The latter were black with orange legs. The following is the description of the moths:

Length of body four lines, expanse of wings eight to nine lines.

Head white, eyes black, labial palpi recurved—first joint large and white, lower half of second joint white, upper brown with a white tip, antennæ filiform, light brown ringed with black.

Thorax reddish chocolate in colour; fore-wings rich chocolate red with a white divided fascia near the hind margin, under side grey; hind-wings pale silvery grey; fringes grey with a faint brownish gloss.

Abdomen golden yellow on the upper side of the three first segments, the rest light brown.

These moths differ considerably from those figured and described by Mr. Kellicott in Vol. X. *Can. Ent.*, p. 201, and from those described by Mr. Riley in the First Missouri Report, p. 172. I would suggest for them the name of *Gelechia gallædiplopappi*.

The life of the Gelechia in its early stages is an interesting and suggestive one. The creature lives and toils in the narrow area of its prison-house, knowing nothing of the higher life and the glorious field for which it is destined, yet impelled by its instincts to make preparations for the change. Dire foes it has; and can it be that some violation of instinct, some erratic course on the part of the larva lays it open to the assaults of these? We know not, but possessed by these, it fails to attain to that nobler state of existence—which things are an allegory, suggestive to us of joys for which we yearn and evils which we fear.

Here as elsewhere this season I could not but notice the abundance of hairy caterpillars, Arctians of various kinds. A large proportion of these caterpillars had been overtaken with a strange disease—a sort of mange—and many had already succumbed to it. The warts upon the caterpillars had dried up, the bristles had blanched and loosened, the intestines had disappeared, and the outer frame of the insect had become spongy, the annules parted at a touch. The unfortunate insects were the prey of a fungus which has been identified by Dr.

Thaxter as *Entomophthora grylli var. aulica* (Fres.) I am inclined to believe that the intense heat following upon the long spell of wet weather that we had in early summer induced the disease. Such an epidemic amongst caterpillars I have not witnessed since the time—some years ago—that the larvae of *Pieris rapae* were swept away by thousands.

Everywhere upon the choke-cherry bushes were to be found colonies of the little yellow, black-headed larva of the Tortrix (*Cucacia cerasivorana*, Fitch). They bind the terminal leaves of the shoots together with a dense web, and carry on their operations under its shelter.

Of the Coleoptera but few specimens presented themselves. I took several of *Coccinella novem-notata* (Hb.), (Fig. 8) and one handsome Leptura, dusky yellow with a distinct black cross on the elytra. This Mr. Moffatt has identified for me as *L. subhamata* (Rand). The order of insects that was most numerously represented on this occasion was the Hymenoptera. Among the species I noticed were *Bombus fervidus*, (Cress), *Bombus ternarius*, (Say), *Bombus consimilis*, (Cress), *Anthophora bomboides*, (Kirby), *Andrena nivalis*, (Smith), *Vespa media*, (Oliv.), *Odynerus cypræ*, (Sauss.), *Eumenes fraterna*, (Say), *Crabro singularis*, (Paek), *Helichrum violaceum*, (Lepelle), *Ichneumon grandis*, (Brulle), *I. latus*, (Brulle), and the males of *Uroceros cyaneus*, (Fab.).

By this time the sun was getting low in the sky, and the voices of my young friends were, I fancied, a little less jubilant than they had been earlier in the day, and feeling the wisdom of not driving pleasure into satiety, I gave the word for the return. Besides my captures, we took back with us a large pailful of raspberries, another of blueberries and a smaller one of *poires*. All of which were afterwards preserved. So we hope that in the dark days of winter we shall be reminded, frequently and pleasantly, of our day in the woods.

OBSERVATIONS FROM THE BOX OF A WHITE MOUNTAIN COACH.

BY FREDERICK CLARKSON, NEW YORK.

On a journey through the White Mountains of New Hampshire, *en route* to Bar Harbor, Me., the past summer, I observed the following Lepidoptera: At Franconia Notch, altitude 2,014 feet, *P. Turnus* was abundant, constantly flying along the drive and in the woods bordering the road. At the Flume, altitude 4,500 feet, by wet places on the road as many as fifty were found congregated apparently enjoying the moisture. At greater elevations *Turnus* was rarely seen and above the timber line I failed to discover any Lepidoptera. At the Crawford Notch, altitude 3,134 feet, and through the Glen, *Turnus* was ever in sight, its brilliant yellow wings contrasting beautifully with the luxuriant green of these primeval forests. In thick woody places, and where the sun shone through in patches, the coquettish *L. arthemis* frequently appeared, ever alighting within your reach and ever darting away again with hide and go seek playfulness. A. *Aphrodite* with wings of "Silver bells and cockle shells" delighted the eye in its graceful flight along the road way between Jefferson and Fabyan, and *C. philodice*, (Fig. 9), rising with the dust at the horses' feet would encircle the coach, and then wander away to join its companions at the roadside brook. *D. archippus*,



FIG. 8.



FIG. 9.

(Fig. 10), the universal beauty, though not numerous in the White Mountains as early as the 11th of August, was occasionally seen flitting from flower to flower

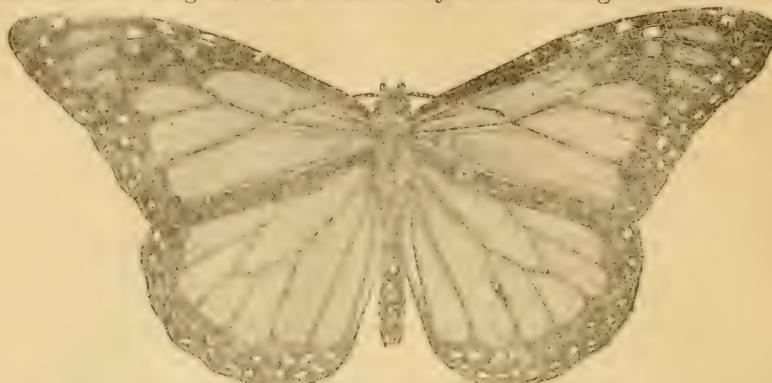


FIG. 10.

with all its well known elegance and dignity of motion. In a small cabinet at the Hotel Waumbek, at Jefferson, there is a single specimen of *Chionobas semideia*, (Say), captured on the summit of Mount Washington. This butterfly, says Seulzer, feeds on sedges and lives upon the summit of Mount Washington; the genus containing several species, is, according to Packard, found on Alpine summits, and in the Arctic regions and on subarctic mountains. It must be a hardy insect to withstand the variable temperature of the mountain top. At the Summit House on Mt. Washington, the mercury on the 15th of July, at 5 a.m. stood at 47°, while a few days previous it was as low as 27°. At midday the power of the sun is felt, and the temperature is as high as that at a much lower altitude.

The cabinet, already referred to, at the Hotel Waumbek, Jefferson, contains the following Lepidoptera, the greater part being captures made at Bethlehem, which is at an altitude of 1,450 feet :

P. Turnus.	S. Alope.
D. Archippus.	P. Cecropia.
L. Misippus.	T. Polyphemus.
A. Aphrodite.	A. Luna.
V. Antiopa.	E. Grata.
G. Interrogationis.	S. do.
C. Philodice.	M. Quinque-maculata.
P. Cardui.	C. Piatrix.

The Profile House, at Franconia Notch, has also a collection of Lepidoptera. The cabinet contains the following, all of which were captured in the vicinity of the hotel, altitude 1,054 feet :

P. Turnus.	P. Cecropia.
V. Antiopa.	A. Luna.
P. Atalanta.	S. Kalmiae.
D. Archippus.	S. Drupiferarum.
P. Cardui.	C. Ultronia.
L. Arthemis.	A. Nessus.
A. Aphrodite.	A. Octomaculata.
C. Philodice.	

A stray setter followed our stage from Mount Washington to the Glen and suggested an Entomological joke which I subjoin, and with which I close this record.

What is the name of your dog ?

Well, I call him Entomology.

Rather a queer name for a dog, isn't it ?

No, I think it singularly appropriate.

Why, Entomology is a science, and means a discourse on insects, in short, it is wholly and altogether a subject of insects.

That's just the reason why I call my dog Entomology, for he is wholly and altogether a subject of insects.

MEETING OF THE SOCIETY IN APRIL.

A meeting of the London members of the Entomological Society of Ontario was held in the rooms, Victoria Hall, London, on Friday evening, April 11th, 1890: the president, Rev. C. J. S. Bethune in the chair. The following resolutions were adopted.

That with a view of increasing the usefulness of the Society and furthering the study of Natural History and the kindred sciences it is desirable to follow the method of the Canadian Institute and the American Association for the Advancement of Science, and permit sections to be formed for the various branches of Botany, Ornithology and Oology, Microscopy, Geology, and such others as may from time to time appear to be desirable. The basis proposed is as follows:

1. All members of the sections shall be members of the Entomological Society and be governed by its rules and regulations and entitled to all its privileges.
2. Any five members may, with the permission of the Council, form themselves into a Section devoted to some special branch, and organize the same, appoint officers and make rules for the meetings, etc., the same not being contrary to the rules of the Society.
3. One-half of the annual fee of each member of a section shall be refunded by the Entomological Society to the Treasurer of that section for the use and benefit of the section.
4. All members of the Society shall be free to attend any meeting of a section and take part in its discussions, but only those shall be entitled to vote who shall have signed the roll of that particular section.
5. A member may elect to be member of one or more sections, but the one-half of the fees returned by the Society can only be paid to one section.

That it is desirable in the interests of the Society that some one should be found who would keep the rooms open daily and be in charge thereof.

The meeting then adjourned.

ORGANIZATION OF SECTIONS.

The following report is taken from the London *Free Press*, of May 5th, 1890:

A most enthusiastic meeting of Naturalists was held in the rooms of the Entomological Society on Saturday evening, for the purpose of organizing sections of the Society for the purpose of active work in the kindred branches of natural history. Sections were formed in Botany, Ornithology, Geology and Microscopy, with the following chairmen *pro tem* :—Botany, John Dearness; Ornithology, William Saunders; Geology, Dr. Woolverton; Microscopy, Prof. J. W. Bowman. Evenings were selected for organizing the sections and the meeting then adjourned. The Botanical section met at once and elected officers as follows:—chairman, John Dearness; vice-chairman, Prof. J. H. Bowman; secretary, Dr. Susannah Carson. The following persons signified their intention of joining the section:—Dr. Jennie Carson, Mrs. W. E. Saunders, Miss Edith McMechan, Miss Fowler, Drs. Hodge and Woolverton, Messrs. E. B. Reed, A. McQueen, A. O. Jeffery, S. H. Craig, Saunders, J. Balkwill, Kelley, A. Craig, R. Elliott and R. A. Gray.

The next meeting will be held on Saturday evening, 10th inst., at 8 o'clock, in the Entomological rooms at which it is expected there will be a large attendance of ladies as well as gentlemen. Mr. Dearness will give suggestions as to collecting and preserving plants, while the identification of plants collected during the week will be an item of special interest. The Ornithological section meets to-night in the Entomological rooms and a general invitation is extended to all interested in the study of Ornithology and Oology to attend so as to make the organization complete at once and ready for the season's study.

ENTOMOLOGICAL CLUB OF THE A. A. A. S.

The Entomological Club of the American Association for the Advancement of Science, assembled in the State House at Indianapolis, Ind., on Wednesday, August 20th, 1890, and began its regular sessions at 9 o'clock a.m., the President Prof. A. J. Cook, Agricultural College, Mich., in the chair.

There were present during the meetings: W. B. Alwood, Blacksburg, Va.; Geo. F. Atkinson, Columbia, S. C.; W. S. Blachley; P. Carter; Prof. E. W. Claypole, and K. B. Claypole, Akron, Ohio; F. S. Earle, Ocean Springs, Michigan; S. G. Evans, Evansville, Ind.; James Fletcher, Ottawa, Ont.; H. Garman, Lexington, Ky.; Mrs. O. Henney; C. W. Hargitt, Oxford, Ohio; Thos. Hunt; John Marten,

Albion, Ill.; Miss Mary E. Murtfeldt and Miss Augusta Murtfeldt, St. Louis, Mo.; W. W. Norman; Prof. Herbert Osborn and L. H. Pammel, Ames, Iowa; R. S. F. Perry; C. Robertson, Carlingville, Ind.; Prof. J. W. Spencer, Athens, Ga.; James Troop and Prof. F. M. Webster, Lafayette, Ind.; Dr. Clarence M. Weed, Columbus, Ohio, and others.

THE PRESIDENT'S ADDRESS.

The President, Prof. A. J. Cook, delivered the following address on teaching entomology :

Ladies and Gentlemen of the Entomological Club.—I congratulate you that another year has passed, and our number has not been broken in upon by death. While our ranks have been much enlarged, no one has been called to that undiscovered country from whose bourne no traveller returns. I also congratulate you upon the great increment in our force of working entomologists. I think I may say, with no fear of contradiction, that no year in the history of America has been so remarkable in this respect as has the last. This is a cause for special felicitation, not only to entomologists, but to all our people. Ours is a tremendous country—by ours I include, of course, our Canadian brothers, for we, as scientists, know no line of separation—and to spy out the entire land needs an army of workers or observers, all trained to keen sight and ready apprehension. But more than this the magnitude of our country is fully equalled by the magnitude of the insect hosts, and to know all of these, with their full life history, requires an incalculable amount of closest research. But our business economy demands this for all our species: for so wonderful is the balance of nature, so close the relations of all species of life, that really we may hardly divide insects into those important and those unimportant in our agricultural economy. All are important; and so from an economic, no less than a scientific standpoint, it is desirable that all such research be widely encouraged, and it is a most hopeful omen—the rapid increase of earnest and trained workers. I shall not in this address occupy time by giving the peculiarities of the season in respect to insects, nor yet call attention to interesting discoveries, like the importation of the *Vedalia cardinalis*. All these will be brought out in papers and discussions. I must, however, refer to the new association for the advancement of economic entomology, which was organized at Toronto a year ago, and which held its first meeting at Washington last November. This meeting, under the Presidency of Dr. Riley, was a valuable one; and that society promises much for the science of entomology, as well as for its economic development. It is also a matter of much interest that a new paper—*Insect News* is started at that great centre of entomology—Philadelphia—which will also do much every way for our science. This, with the very excellent periodical *Insect Life*, published by the Entomological Division of the Department of Agriculture, can but give new impetus to entomological research. In addition to these, we have an addition to Prof. Comstock's admirable work, which when completed will form a most valuable adjunct in the development of entomology. If we may judge from what we already have, this will be invaluable in every entomological laboratory. When the Society of Economic Entomologists was organized a year ago it was remarked by one of our first entomologists that that move sounded the death-knell of this Club. I then remarked that such ought not to be the case. That Society is to be composed only of those interested in economic entomology, and of course will only put emphasis in the direction of the practical aspects of the science; this more or less of entomologists in a wider sense, and so will include those interested in practical entomology and also in

the science without relation to utility. The Club then may well continue. I believe it will live and thrive, and will be most helpful to entomologists and to our science. While the other Association will discuss economic questions, this Club will place no limit on either its discussions or its membership, only so far as entomology shall be its aim and purpose. No one doubts but that he who has a thorough training in the science of entomology will be far better prepared for practical work, and so there can be only the most cordial relations between the Association of Economic Entomologists and this Club. Indeed, many of our most active entomologists will be members of both. I have already stated the truism that only can he do the best practical work in entomology who is thoroughly well grounded in the general science of entomology. As we now have a great call for entomologists in our experimental stations, agricultural colleges, and as State entomologists, not to speak of the fact that every farmer and fruit-grower would be more successful if he were well-informed in this science, it goes without saying, that there ought to be in training men for just such work. It seems to me that it needs no argument to show that our agricultural colleges are just the places where this training should be given. They were founded to teach those subjects which would be most serviceable on the farm. Entomology is one of the chief of these. Thus it follows that every student of agriculture should have a thorough course in this science, with the practical aspect of the subject kept in the foreground. In thus presenting this science to large classes—I have from thirty to forty each year who study this subject in the course—the teacher will find some in each class who are specially fitted to succeed. They enjoy the study and work most earnestly just for the love of the pursuit. They have quick observation, and are very accurate and honest in all their work. It needs no prophet to bespeak success in this field for such students. Our agricultural colleges are just the places to discover the men who have great possibilities in this direction; just the places to give the training that shall best fit men to do the most valuable work. It will be my purpose in the remainder of this address to describe the equipment for such work, and to explain the method which I believe will give the best results. Of first importance is a good library; this should contain all the standard works, periodicals and monographs, so that students who may decide to study any insect or genus, may find what has been written on the subject. Of course this cannot be had at once, but it is so essential that no effort should be spared to build up a complete entomological library at the earliest possible moment. *True* the scientist should study *things*, not books, but he will find a wide use of books most helpful in his study. Next to a library, such colleges should have good collections, which are often of more value than the library. A small show collection, illustrating the families and orders, and the several stages of the most injurious species of the place as well as the groups of beneficial ones should be open to the public. This will be studied and appreciated by the practical farmer, who, as he visits the college, will find it helpful, and will also interest and stimulate the under-class men, who will thus have their attention called towards insects before they commence the regular study, which will not occur till they are well along in the course. Drawing, botany, microscopy, and French and German, if thoroughly understood, will be great aids to the student who commences the study of entomology. Thus this study will come late in the course and the show collection will be whetting the appetite of the under-class men from the time they enter college until they commence the study. I would also have what I call a student collection—this is a pretty full collection from the locality of the college. This I would hang upon the wall of the lecture room, which I would have dark, except when in use, so as to preserve the colour of the specimens. I would have this in rather small cases,

with glass in front and also back where it is desirable, as in case of Diurnals, to study both under and upper sides of the wings. This collection should show at least types of each group in all stages, from egg to imago, as well as nests, cocoons, etc. This is an object lesson ever before the student, is ever ready for use by the teacher to illustrate his lecture, and is at the disposal of the students in naming their own collections or in closer study of any group. It seems to me such a collection should be in every college. Lastly, I would have a laboratory collection which should be a biological collection, and the fuller the better. This is in large, tight, glass-faced drawers. I use the Harvard case. This is for the use of teachers and post-graduates who desire to study further in the science. It is too valuable for general use by the student or to be kept to satisfy general curiosity.

As I have before remarked, before the student commences the study of insects he should have had a good course in free-hand drawing, should have had instruction in the use of the microscope and in preparing microscopic specimens and slides, and if he has a ready use of German and French it will be very helpful to him in his study. It is also desirable that the student should have had a full course in botany. The students of our college have had three terms of botany, one devoted entirely to microscopic botany, before they begin the study of entomology. I consider this very valuable preparatory work. Entomology is very close precise work, and the laboratory work if carried on for a less space than three hours at a time is not satisfactory. But three hours of such close work is very wearying unless the student has had a fitting preparation. Thus I am pleased that our students have had *vertebrate dissection* with human and comparative anatomy and physiology before they commence entomology. I know this seems the reverse of the natural method; as nature proceeds from lower to higher; vertebrate dissection is lighter and less trying to eye and brain than is the study of insect anatomy; thus I am pleased to have Anatomy and Physiology of Vertebrates precede that of the Arthropoda in our course. In our college the student attends a course of sixty lectures on the anatomy and physiology of insects, systematic entomology and the economic bearing of the subject. These lectures are illustrated by use of models, the student's collection of insects, already referred to, by microscopic preparations, mostly prepared at the College, and elaborate charts and drawings also prepared specially for our use. In connection with this course there are 36 hours of laboratory. Each student works three hours one day each week for twelve weeks. In this time they are able to study the internal anatomy, and to examine carefully and accurately one insect of each order. In connection with this several insects are traced to the genus by such keys as Leconte and Horn, Cresson, Williston, etc. Besides the above, each student makes a collection of from ten to twenty-five insects of each order, all neatly put up with date and locality label; each order by itself and all labelled as far as time will permit. Many students succeed in naming a large number of their specimens. Each student is also required to mount insects in all the approved ways. Small insects mounted on triangular pieces of cardboard or rectangles of cork with silver wires, while the larva are put in bottles of alcohol with rubber corks and also prepared by eviscerating and drying, while distended with air, in a heated oven. The students are also encouraged to prepare biological collections, in which they preserve the eggs, larva after each moult, pupa, cocoon, imago of both sexes, and of various sizes and the several variations. Some of our most enthusiastic students work out several such life histories, describing not only the separate stages, but the several parasites that work to destroy the insects. I regard this work as very valuable. It is excellent discipline for the mind and observation, gives accurate information of the most interesting kind, and arouses

enthusiasm for the study as nothing else can. It is such work as this that will tell for the future of entomological research, that will make entomologists, who will honour alike the fields of pure and applied entomology. But such study ought not and will not stop here. Post-graduates will avail themselves of the opportunities which such laboratories offer. Last winter during our long vacation—ours is an agricultural college and our vacations must needs occur in winter, when farm operations are largely at a standstill—I had ten special students of entomology in my laboratory, one from South Dakota, one from Indiana, one from Ohio, one from Japan, one from Wisconsin, and the others from our own State. Nearly all were college graduates. Six special students, all graduates from colleges, have spent the year in my laboratory in special entomological study as post-graduate students. It seems to me that such are the young men who are going to develop the entomology of our country. They are the young men who can and will do grand work in our colleges and experimental stations. These young men each take up some special family or genus of insects, to which they give the major part of their time and study. They collect in all orders and give special attention to biological work, tracing the life histories of insects, identifying as far as possible the insects they capture and trying to become familiar with entomological literature, so far as they are able. The students are mutually helpful to each other. As the laboratory may be said to be a sort of perpetual Natural History, or more accurately Entomological Society, thus the students become familiar with the general laboratory work, in fact, they each become a factor in some degree in carrying the work forward. Here I will close by explaining briefly the mode of our laboratory work, which differs in some degree from the admirable plan which Prof. Forbes explained at the Washington meeting of Economic Entomologists last November. Our labels give in compact space locality, date accession and species number. The accession number agrees with a number—serial number—in our accession catalogue for the special year. Thus, ac. 400 shows that the insect or insects bearing that label were the 400th collected during that season. The sp. number is given as the insect is determined, and is the number of the insect in the catalogue which we use. Thus, sp. 25 is "Cicindela purpurea," as the beetle is numbered 25 in Henshaw's catalogue of Coleoptera. In case the catalogue is not numbered, as is the case with Cresson's list of Hymenoptera, then we number it. We have a column in our accession catalogue for date, collector, person who named the specimen, and also for remarks.

This last column is wide, and in it we can usually write all necessary information which we receive in the collecting. If we are experimenting with or studying the insect, our notes are kept on cards. These are numbered to agree with accession catalogue, and are kept in serial order until we know the species when we add the species number as well. We now index the card and place it in its correct alphabetical position in our card collections. Thus we can very easily find our notes on any specimen, either by accession number or by the name of the species. This plan works well, and, it seems to me, is very economical in respect to time. Of course our students all see this scheme and become familiar with its workings.

HESSIAN FLY, WHEAT-STEM MAGGOT AND OSCINIS.

Mr. J. Fletcher presented some notes upon injuries caused by the Hessian Fly, the Wheat-stem Maggot and an undetermined species of Oscinus. He said that the note was presented with the object of eliciting further information upon a subject which had proved of great interest to him. During the past season he had endeavoured to determine the number of broods of the Hessian Fly for the

Ottawa district, and had found, first, that the Hessian Fly, the Wheat-stem Maggot and Oscinis were all found at the same time and in the same plant, and further, that, speaking generally, they passed through their stages contemporaneously. Of the three the last had proved much the most destructive. From root shoots of wheat sown on the 14th of April he had bred Hessian Fly and Oscinis at the end of June, and a month later Meromyza had appeared. He had also noticed in some fields at Ottawa that a large quantity of spring wheat was attacked by Hessian fly in the ground shoots or stools in the same manner as fall wheat is attacked in the autumn. It was frequently the case that on plants which had made from fifteen to twenty stools but one would be left, all the others having been destroyed by the insects. He had procured adult Hessian Flies at Ottawa during this season in the beginning of May, at the end of June, and in August, and they would probably appear again in September. He had not been able to find the Hessian Fly breeding in any of the grasses, and would like to know if others had done so. Meromyza and the Oscinis had been most troublesome pests in the experimental grass patches at Ottawa, some grasses being almost exterminated by them. It was remarkable that the spring appearance of Meromyza had been so enormous as to have caused fear of a serious destruction of the wheat crop. As a matter of fact, however, there had been less injury, both to small grains and grasses, than for many years previously. This diminution he could only explain by the supposition that the eggs had been destroyed by some predaceous insect. The eggs must have been laid in large numbers, but there was very little evidence of the presence of the larvæ, either in the standing wheat or barley, or in the root-shoots of barley. The Oscinis he had been unable to identify; but, through the kindness of Mr. John Marten, of Illinois, he had learnt of some work which had been done by Prof. Garman in Kentucky, upon what was probably the same species. This, Mr. Marten said, had been doubtfully identified by Dr. Williston as *O. variabilis*.

Prof. Garman stated that he had studied what appeared to be the same species, and had prepared an article for publication. He also gave some notes upon the life history and anatomy of the insect.

Prof. Osborn had taken at Ames, Iowa, numerous specimens of Oscinis, one of which closely resembled that exhibited by Mr. Fletcher.

Prof. Alwood had studied in Ohio an Oscinis infesting oats, and had published his results in Bulletin 13, Division of Entomology. He had found the eggs, from two to eleven in number, were forced beneath the sheath of the leaf, and that just prior to pupation the larvæ gnawed through the epidermis and the pupa protruded so as to admit of the easy escape of the adult.

Mr. Fletcher, referring again to Meromyza, stated that in many instances he had found the eggs deposited in the field upon the upper surface of the leaf some distance from the stem, and asked if others had observed this to be the case elsewhere.

Prof. Garman had found that the eggs were laid just above the sheath, or sometimes pushed beneath it.

Prof. Webster stated that the eggs of the Hessian Fly, had, in the spring of the present year, throughout Southern and Central Indiana, been deposited near the roots, the "flax-seeds" being found in that portion of the plant; while in the northern part of the State the case had evidently been different, as the "flax-seeds" were there almost invariably located about the second joint.

The Secretary read a paper by Mr. Edward L. Graef, of New York, upon the American Silk Worm Moths or Spinners, in which a serious attack upon the

shade trees of New York by *P. cecropia* was recorded, and the suggestion made that this and other species might be turned to account, if any means could be devised for manufacturing and utilizing their silk. As a stimulus to this industry, Mr. Graef generously offered a prize of fifty dollars for the best essay and model of apparatus for carrying this suggestion into effect.

SECOND DAY'S SESSIONS.

The Club met on Thursday at 8 a.m. Dr. C. M. Weed read an interesting paper upon the clover-stem borer, *Languria mozardi*. Fifteen species of plants were reported upon which the larva had been found feeding. This paper was discussed by Profs. Cook, Alwood, Osborn and others.

Prof. Alwood spoke of tobacco insects, of which he was making a special study. He had observed a stem borer which was very injurious.

Dr. Weed had learned of a tobacco root-louse in Southern Ohio.

Prof. Garman spoke of the mouth parts of several species of some families of Thysanoptera, and stated that some recent studies had shown him that the figures published did not agree with his material. He then read the following paper, entitled "An Asymmetry of the Head and Mouth Parts of Thysanoptera."

In a brief paper in the Bulletin of the Essex Institute I have recently called attention to peculiarities in the structure of the head and mouth parts which set this group quite apart from other orders of Hexapoda. [This has no reference to affinities upon which, I believe, we are not prepared to pronounce until this and several other groups have been more completely studied.] In that paper it was claimed that the endocranum of the species examined was not symmetrical, being deficient on the right side; that the labrum was one-sided; that there was a developed mandible on the left side, with, at most, a rudiment on the right; and that the mandibles of authors were probably lobes of the maxillæ.

At the time the paper was written I had not examined sufficient material to enable me to say whether the features pointed out were limited to certain species or were common to all members of the group. Since then many additional forms have been examined, all, however, belonging to the families Stenopteridae and Coleoptratidae, and in no case has there been found a departure in essentials from the structure of the head and mouth parts as they were described in the paper referred to. It is probably safe to assume, therefore, that the asymmetry noted is characteristic of these two families at least.

Of the group Tubulifera no representatives have been studied, I shall not be surprised, since this is the lowest of the suborders, if examples of Phlaeothrips are found to be more nearly symmetrical.

As an interesting fact, though in no way related to the main purpose of this communication, I may mention that the solitary mandible of Limothrips and Melanothrips is perforate, like the jaws of larval Chrysopa, of Dytiscidae, and of Myrmecleon. In specimens of Coleoptratidae examined, both labial and maxillary palpi are composed of three segments.

Note.—Since my return to Lexington from the meeting of the American Association I have secured a couple of very young Phlaeothrips. My examination of these is not completed, but I have succeeded in demonstrating the single jaw on the left side. The parts are greatly elongated, and remind one of the same organs in Hemiptera. The styliform parts are especially long, extending, when

retracted, into the cranial cavity towards the eye, thence bending posteriorly and extending along the posterior wall of the head to the mouth opening. Both mandible and styliform parts are perforate (or possibly grooved).

Two unmistakable tarsal claws are present in this genus. From their relation of position to the pads the latter would seem to be modified pulvilli.

Prof. Osborn was much pleased with what Prof. Garman had stated. He had also observed some of the points mentioned in a special study which he had made of these insects, and hoped Prof. Garman would publish his results as soon as possible.

Dr. Weed presented a short paper on the oviposition of *Listronotus latiusculus*. The eggs are laid in clusters of from five to ten upon the leaf stalks of *Sagittaria variabilis*, and are covered with small pieces of the epidermis which are nibbled off by the adult beetle. This was discussed by Messrs. Garman, Fletcher and Webster.

Mr. Charles Robertson, of Carlinville, Ill., read a most interesting note upon the habits of the bee *Emphor bombiformis*, which was originally described by Creason as a *Melissodes*, but Paton, in revising the genus, raised it to *Emphor*. This bee, it was stated, confines itself almost exclusively to *Hibiscus*, chiefly *H. lasiocarpus*. The appearance and habits of the bee were described. It was stated that in collecting these bees it is important to catch those flying around the plant without alighting, as these were generally the males, whilst those visiting the flowers for honey and pollen were the females. On August 5th, when walking along a dam with water on one side, he had noticed a female standing upon the water; she then flew to a bank, and he observed that she was carrying water to facilitate the excavation of hard ground, into which she was burrowing to build her nest. Sometimes one pellet of earth would be taken out after such an application of water, but at others three or even four. An interesting discussion followed which was participated in by Messrs. Osborn, Cook, Weed, Fletcher and others.

Prof. Osborn read the following note "On a Peculiar Form of Coleopterous larva": Eleven years ago, while a student in college, I found a peculiar form of larva boring in the twigs of ash trees, and it was described at the time in the students' journal at the college (The Aurora, May, 1879, page 5.) under the caption "A Grub With Legs on its Back." The description is as follows: "The specimen was found boring in the pith of a small twig on an ash tree near the road west of the college, apparently beginning at or near the tip of the twig and working downward. Numerous twigs were found that had been inhabited in this way, but only one specimen of the borer was found—this about a quarter of an inch long, quite slim, and nearly white. Its great peculiarity consists in the disposition of its locomotive apparatus. The first three segments following the head are provided with the usual pair of legs, each in the normal position—that is, on the ventral surface. The following six segments are provided each with a pair of pro-legs, similar to those found on many caterpillars, but, strange to say, these are arranged upon the *dorsal surface*, exactly the opposite of the usual arrangement, while the number six is different from either the caterpillars, where there are four or five, or the saw-fly *larva*, which have eight. The remaining three segments have no propellers whatever. The beauty of this arrangement, for the conditions of the borer, can at once be seen, for it has as much foot-hold above as below. Placed upon a flat surface it could make no advancement, but wriggled awkwardly about, evidently seeking its double foot-hold. Placed between two thin plates of glass, it moved rapidly, using all its legs, and going with equal

facility backward or forward, either side up. If provided with some support at one side it was possible for it to travel by means of the legs on its dorsal surface alone."

During the present season an example of a similar larva has come to my notice, specimens being first observed by Prof. L. H. Pammel, occurring in the stems of *Helianthus*. Their possessing similar locomotive organs upon the back called to mind the peculiar larvae noticed years ago. They differ, however, somewhat in colour as well as in the plant on which they occur, and I find that they attacked voraciously dipterous larvae that were living in the same stems. Whether they are normally carnivorous remains of course to be determined, but there can be no question of their attacks upon these larvae, and apparently with the intention of obtaining food from them. These specimens are of a light bluish colour, possessing pro-legs upon segments 4-9, inclusive, and a pair of tubercles on the ventral portion of the anal segment, as well as a dorsal tubercle on the terminal portion of the same segment. In general appearance there is a striking resemblance to the *Languria* larva, as shown in figure exhibited by Dr. Weed, but in his drawing there is no indication of the dorsal feet.

The Club convened at 5 p.m., and considered the following resolution:—

Resolved, That it is the sense of the Club that the meetings of the Association of Economic Entomologists and of the Entomological Club would both be benefited by holding such meetings, if possible, at the same time and place as the meetings of the American Association for the Advancement of Science.

After discussion by Messrs. Fletcher, Osborn, Cook, Alwood, Weed and others, the resolution was unanimously adopted.

The Secretary read a paper by Prof. D. S. Kellicott, of Columbus, O., upon the "Preparatory Stages of *Eustrophia cedula*." He had collected the larva upon *Nuphar advena* at Rives Junction, Michigan, in 1876. From these he had bred a moth, afterwards named by Mr. Grote *E. cedula* in the *Canadian Entomologist*, Vol. 8, p. 207. During July of the present year he had again collected the insect at Corunna, Michigan, and had succeeded in breeding and describing all the stages, which were submitted herewith.

The larvae found in 1876 were feeding in the fruit but those studied during this summer were found upon the leaves. If these latter were floating, the larvae were exposed on the upper surface, in other cases they were beneath or concealed in folds. A different habit of swimming to that of *Arzama obliquata*, which progresses by horizontal undulations, was noted. *E. cedula* swims strongly, but by an entirely different motion. The posterior third of the body is bent downwards like the tail of a crayfish and then quickly pushed backwards, thus driving the insect ahead by jerks.

Discussed by Messrs. Weed, Webster and others.

Prof. Cook reported having bred *Agrotis C-nigrum* through all its stages upon black currant, the eggs having been laid in a cluster upon leaves of that plant on 1st June—the perfect insect appearing on the 1st of August.

Prof. H. Osborn read a note on the "Period of Development in *Mallophaga*." The habits of the species of *Mallophaga* render accurate observations upon the time required in development of the eggs a matter of considerable difficulty. While in some of the species upon very common birds it is possible to get an abundance of material, in other cases the opportunities for obtaining such material are very rare. But in the most common species the difficulty of determining the exact time of deposition of eggs, and then of keeping individuals in such conditions as to insure a normal development, makes positive observations difficult. This being the case, any observations which may add to our knowledge of the subject seem of interest, and the present note is offered as one such contribution.

The species chosen in the present case is the *Nitzschia pulicaria*, which is almost invariably to be found in abundance on the common chimney swift (*Chaetura pelasgia*). This bird is an abundant resident of the building in which my laboratory is located, and being readily obtained on account of its tendency to fly in at the windows, I suggested to Mr. P. H. Rolfs, a graduate student in biology, that he attempt the rearing of larvae from eggs with a view to determine length of developmental period in connection with studies of its embryology.

For this first purpose he secured on two separate occasions a number of the eggs, and kept them, part in a tight paste-board box, which was kept warm by the heat of his body, the others were enclosed in cotton-plugged tubes under a hen that was kept in the laboratory at the time for incubating eggs for embryological work. Of the first lot, all kept in pocket, secured July 27th, two eggs hatched August 4th, five between August 8-13th, one August 16th, the last giving twenty days, the longest period.

Of the second lot secured, August 3rd, six hatched between the 8th and 13th, four hatched August 14th (three in box and one in tube), two August 15th (one in box and one in tube), part not hatching, and the longest period in this case being thirteen days.

Assuming that those requiring the longest time had been deposited but a short time before the experiment began, we should have from fifteen to twenty days as the ordinary time required for the eggs to hatch for this species.

Mr. F. S. Earle presented some interesting notes upon the injurious insects of the season in Southern Mississippi. *Diabrotica 12-punctata* was a very abundant insect, and in addition to its well known food plants, it had been a serious pest to peach trees and cabbages. Leaves of the latter, bitten by the insect, at once decayed from the point of injury. Cut-worms were very destructive in gardens, and cucumber and melon vines were much injured by a plant-louse. Potatoes had been much attacked by a black flea-beetle, and the tomatoes by the boll-worm in the fruit, and on the leaves by the sphinx larvae.

Prof. Cook would like to hear the experience of those present as to a practical remedy for the attack of the boll-worm upon the fruit of tomatoes.

Prof. Osborn said that Mr. Tracy had tried arsenical mixtures with some success, and also had attracted the perfect insects to light.

SOME EXPERIENCES IN REARING INSECTS.

Miss M. E. Murtfeldt read the following paper:

In rearing insects, as with many other enterprises in life, we climb the ladder to success by the rounds of successive failures, having in many cases to exhaust an almost infinite range of "how *not* to do it," before arriving at its happy converse.

Many and great are the disappointments of the entomologist; but does he succumb? Never! What single point in the biology of a species has been relegated to the absolutely undiscoverable? I do not know of one, no matter how obscure the subject or how little advance has yet been made in the direction of its elucidation.

"Hope springs eternal" in the breast of the entomologist, and patience and perseverance have in him their "perfect work," until Nature relents, or is caught "off guard," and the secret, so carefully hidden, is revealed.

I am tempted to enumerate some of the discouraging circumstances encountered by the biologist in this field.

Among the *Lepidoptera*, a majority of the *Bombycida*, *Geometridae* and *Noctuidae* adapt themselves readily to the conditions of the rearing cage. They accept the food provided and make the best of it, even after it has become a little dry, which must sometimes occur when the caretaker is pressed for time. They thrive in the closer and darker air, and take such exercise as they require within their narrow walls of glass and wire-cloth, and when the metamorphic impulse comes, they contentedly weave their cocoons in the corners of their prison, or bury themselves in the two or three inches of cemeterial earth in the bottom of the cage, and safely pass those mysterious transformations which give to this class of beings their pre-eminent interest.

But there is a great deal of individuality, or rather, specificality, in insects, and not infrequently specimens of larvae are found for which the collector taxes his ingenuity in vain to provide. Not the freshest of leaves, the cleanest swept earth or the most well-aired of cages will seem to promote their development. They wander about the cage with an exhausting activity that pathetically suggests a realisation of their imprisoned condition. They nibble languidly at their food, and aimlessly spin mats of web in inconvenient places, over the cracks of the door or cover, for instance, and, before long, comes the morning, when they are discovered dead and discolored in the bottom of the cage, *and no more of them to be obtained until another season*. Or perhaps the cocoons are spun or the transformation to pupae safely effected under ground, and the entomologist has full confidence that in due time he will obtain the much desired imago, and, when it may be expected, watches hourly for its emergence, and is rewarded by the appearance of an *Ophion* or a swarm of *Tachina* flies, or of some still smaller enemy, whose existence he did not even suspect.

Again, the collector may be obliged to delegate his cares temporarily to another, who, unused to the almost constant supervision necessary, suffers the precious larva to starve, or, by an oversight, tosses it out with the withered leaves, or crushes it in the hinges of the door, or, still more aggravating, thoughtlessly raises the cover and allows some long looked for imagine to dart out and escape through an open window. All that he will remember for the benefit of the person chiefly concerned, will be that it was a moth and "seemed something peculiar." As the entomologist cannot afford a separate cage for each species, and as he had probably put his choice unknown in with some well known forms of which he wishes simply to increase his duplicates, he probably grasps at the hope that the escaped insect was one of the latter, and so defers the full realization of his loss until weeks and months have passed and all his expected species have emerged, and then he hopes for better success another year, and finds "life well worth living" for this and similar reasons, which only an ardent naturalist can appreciate.

In some respects too much care is as subversive of success as too little. For instance, the very natural curiosity which the student feels to examine into the state of the insect after it has been buried for a short time in the earth. So he sifts the soil in his cage; and though he handles it with all caution, the frail earthen cell in which the treasure is enclosed falls in pieces, and the poor caterpillar in complete helplessness squirms in the loosened earth. Despairingly he tries with clumsy fingers to re-inclose it in the fragments of its cell, or attempts to form a substitute by packing the earth so that it may not be smothered. In vain. In ninety-nine cases in a hundred he never sees the imago.

While the hardy pupae of most noctuids will bear any amount of handling, and by their activity will beat hard the earth about them at any time, a few

species absolutely resent the least disturbance. I think that for seven or eight successive years Dr. Riley and I tried in vain to obtain the imago of a beautiful larva found every autumn in greater or less numbers on *Gnaphalium*, and occasionally on the Asters and some other *Composita*. Not being able to associate it with its species we designated it the "pretty cut-worm." It was Dr. Riley's practice to have the earth in his cages sifted occasionally during late autumn and winter to see how the pupæ were faring, and to have each species collected into its particular corner or side of the cage, which was designated by the label on the door.

But in the case of this particular species this orderliness was fatal. After Dr. Riley went to Washington, I resolved on the "let alone" policy. I put the larva into a cage with clean earth with an admixture of sand which I dampened slightly and only at considerable intervals during the winter, kept the cage in a very cool place, and the next summer was rewarded with several fine specimens of *Manestra legitima*, my only disappointment being that it was a species by no means uncommon.

With me *Scopelosoma sidus* behaved in an almost equally capricious manner, but was, after many trials, finally reared by adopting the same methods as with *legitima*. I now make it a practice to sift or change the earth in my cages only in the spring and autumn before the hibernating pupæ are formed. Of course, if I wish to note pupal characteristics, I have to run the risk of the disturbance, but this is only occasional. I have found that frequent dampening when the cages are kept in doors, is also detrimental, and that hibernating larvæ and pupæ are far less likely to suffer from drought than from dampness.

In rearing the Micro-lepidoptera—in which I have an especial interest—various tactics must be pursued, and the imagination is often vainly taxed to suggest a provision which the delayed changes and general unrest of the insect plainly call for.

Under natural conditions it is very difficult to keep track of these small creatures. The leaves or flowers or fruits on which they may be found feeding on one day will be deserted by the next, and during the darkness they will have betaken themselves to parts unknown, the most assiduous search failing to discover them. In the rearing jar some species adapt themselves very kindly; others will crawl about for days spinning threads of silk over sides and cover and finally dry up without effecting their transformations.

An accident to which the student is liable, and against which he can with difficulty make provision, is to have the larva, which he has perhaps just described and figured, escape. How often have I taken up a bottle in which I had been rearing a particularly precious unknown, and found a tiny hole in the muslin cover, or perhaps a little flap cut at the edge of the bottle, telling only too surely of the loss and delay which a further examination verified. The annual brooded species which appear in the spring are the *betes noir* of the Micro-lepidopterist, especially such species as pupate on or just beneath the surface of the ground. They have to be cared for during the long, hot summer, as well as the autumn and winter, and to keep the safe middle course between the *Scylla* and *Charybdis* of drought and of the dampness which would promote the equally fatal mould, requires most careful attention. The annual brooded species which later fold or mine the leaves, or feed in the fruit capsules of various plants, or bore the stems, are comparatively easily reared, with a few exceptions. It was a number of years before I succeeded in obtaining the moth from an interesting larva which fed in the capsules of *Pentstemon*. This was owing to the peculiar change of habit during hibernation. After eating all the seeds from

both divisions of the capsule, it would thoroughly line one all with silk, after cutting an aperture for escape, and ensconce itself, as might reasonably be supposed, for its winter's sleep. But no; the neatly lined cell was only a temporary abode, which, during the inclemency of mid-winter, was to be deserted for an entirely different one. Where, in the state of nature, I have not yet been able to discover. In my rearing jars it perished, year after year, to my inexpressible disappointment, until finally I wintered a number out of doors in a small wire cloth box closed with a cork. From this collection I at last obtained the moth—a beautiful *Conchylis*—from a larva that had bored into and transformed within the cork. But for two or three years I had only the single specimen, and next to the aggravation of utter failure I rank the possession of an unknown unique. It may be new, and if sent to a specialist he will generally feel somewhat aggrieved if you reserve the right of description and further impose upon him the duty of returning the specimen. Then there is the danger of its destruction, either in the mail or express, to be braved, and yet, so long as one does not know the species, or be assured that it is new, one never can take full satisfaction in having bred it.

Last year I had the satisfaction of obtaining nearly a dozen imagines of the *Conchylis* in question by providing a number of bits of pith and cork in which the larvæ bored after their desertion of the capsules where they had fed.

Whenever I can make satisfactory arrangements for keeping track of them, I winter my Micro-larvæ and pupæ out of doors. Such species as bore the pith of stems are very easily cared for, and leaf miners and webbers I enclose on the surface of the ground, in some sheltered situation, under wire sieves or covers, bringing them in in the spring in order to have the little moths emerge where they can more easily be chloroformed or transferred to the cyanide bottle.

I must confess that I have never had signal success in rearing such species of the *Tenthredinidae* as transform under ground. I have in mind more than half a dozen species—the larvæ of which are most interesting—of which I have so far failed to obtain the imagines, in spite of my utmost care.

The leaf and root-feeding beetles have always developed satisfactorily for me, but the *Cerambycidae*, which feed on growing wood, have given me much trouble, and, in many cases, failed me utterly.

Orthoptera require but little care, as also do leaf-feeding *Hemiptera*, but the Cannibal species of both these orders are more difficult to cater to, and often refuse a diet that one would think would be irresistible. This is especially true of the carnivorous bugs which I have found require large space and ample provision to preserve them from fraternal rapacity.

With the aquatic orders I have had but little opportunity for experiment, but think they must furnish many very interesting subjects.

I believe that costly insectaries are being constructed by many entomologists, and no doubt will afford room for much thorough study of forms and habits. But such costly appliances are not absolutely necessary, and sometimes make observations more difficult than when the conveniences are more primitive.

A secure enclosure, fresh food, fresh air and clean water in the bottles are almost the only requisites in rearing the herbivorous species, and the more constantly the cage or jar is under observation the more thoroughly of course are the history and habits of the species revealed to us. When I wish to know all about a species, I keep the cage or jar on one corner of my desk and watch its occupant in the intervals of other work.

I cannot hope that I have conveyed much information in these notes to those who have gone over the same ground, but I am at least sure that I have recounted some of the experiences of every biological student of insect life, and can sympathise in his disappointments and appreciate the satisfaction of his successes.

THIRD DAY'S SESSION.

The Club met on Friday at 8.30 a.m. Dr. Weed presented a short paper on the habits of *Lixus concavus*.

As reported in the bulletin of the Ohio Experimental Station, Mr. Alwood had found this insect injuring the stems of rhubarb. During the past summer he had bred it from all parts of the stem of the common curled dock.

Prof. Alwood stated that he had observed the larvae of *Gortyna nitela* eating those of *Lixus*.

Dr. Weed read a paper upon the habits of *Psephenus Lecontei*.

Prof. Webster and Mr. Fletcher also spoke on the habits of this beetle.

Prof. Hargitt read a note upon a large foliaceous gall which destroyed the tips of the stems of various species of *Solidago* at Bloomington, Indiana. In many instances as many as ninety-nine per cent. of the flower stems had been destroyed.

Prof. Hargitt read a note upon the Canker Worm. He said: "My attention was drawn to an orchard near Oxford, Ohio, which, for three or four years, had been seriously affected by this pest. In May, 1890, I went to examine the orchard and found it thoroughly over-run by the larvae, many of the trees being actually dead, and several others in a very weak condition. The orchard, viewed at a distance, had the appearance of having been burned, the leaves being brown and dead. The trees were most attacked upon the outer rows, particularly those adjoining a wood. I recommended spraying with one of the arsenites, but it was too late for the present season. I observed several small birds in the orchard actually engaged in feeding upon the larvae, amongst them the cedar bird, blue bird, summer warbler, chipping sparrow and field sparrow."

Prof. Hargitt also read a note upon *Cermatia forceps*. He had found that this Myriapod had become abundant in houses and the college building at Oxford, Ohio, during the past two or three years. He had experienced the same difficulty in keeping the insects alive in captivity, as was mentioned by Dr. Lintner in his 4th Report. He had succeeded in keeping them for several days and inducing them to take prey by keeping them in dark quarters in a tin canister during the day. When so confined they had fed freely upon house-flies, and other insects supplied them.

Prof. Webster spoke of the predaceous habits of *C. forceps*, and its special fondness for the Croton-bug (*Ectobius germanica*).

Mr. Fletcher had observed the insect when visiting Mr. Howard at Washington, D.C., who had described to him its remarkable habit of capturing the Croton-bug by springing over it and thus encaging it beneath its many curved legs. He was of the opinion that those who had failed to keep this insect in captivity had done so from omitting to supply a sufficiency of moisture, and thought that Mr. Hargitt's success in the instance mentioned, where the insect was put in a tin can, was more due to this cause than to the darkness. Myriapods are general found in damp, dark places.

ELECTION OF OFFICERS.

The Club proceeded to elect officers for the ensuing year. Prof. Cook, the retiring President, congratulated the members upon the harmony which had existed throughout the sessions, and was glad to find that, although some old and pessimistic members of the Club had predicted that it had run its course and would soon flicker out like a spent candle, he was glad to find that the present meetings had not only been the best attended for many years, but that the discussions and papers had been equally interesting to those of any meeting which he had had the pleasure of taking part in. He wished the Club every success and trusted that it would grow stronger and stronger every year. The following officers were elected:—

President, Prof. Herbert Osborn, Ames, Iowa.

Vice-President, Miss Mary E. Murtfeldt, St. Louis, Mo.

Secretary, Dr. C. M. Weed, Columbus, Ohio.

CONTAGIOUS DISEASES OF INSECTS.

Prof. Osborn, at the invitation of the President, introduced the subject of the use of contagious diseases in combating injurious insects. He said that he had already published a paper in the Transactions of the Eastern Iowa Horticultural Society for 1886, pp. 400-405, upon the subject; but that it was of such importance that he desired to hear it discussed by the members of the Club. He first mentioned the well-known fungus and bacterial diseases which attack insects, as Muscadine, Grasson or Jaundice, Pebrine, Flacherie or Flaccidity, Foul-bread of Bees, Fly and Grasshopper Fungus, and the White-grub Fungus, and called attention to the fact that we were already able to control those which affect important domestic species, as Silkworms and Bees, and that to some extent at least we are able to control these available as agents in destroying injurious species. After considering the various conditions limiting the applicability of this means, he drew the following conclusions:—

(1) That there are diseases amply sufficient as a basis for economic work, the bacterial forms giving the most promise for all cases where early results are desired, while those due to fungi, so far as present knowledge goes, propagating slowly, can only be used as slow but efficient checks to injurious forms, the most that we can do with them being to introduce them in localities where they are not already found.

(2) That the diseases can be controlled to the extent of preserving the germs for a season and transporting them from place to place to use for inoculation, but that their spread in nature will be affected by conditions beyond control, while only such insects as occur gregariously, or live in winged hosts, can be attacked to advantage.

(3) That the cost of application would prevent its adoption except in certain forms.

(4) That we must consider this method of contending with insects at best as but one of a number of profitable methods to be used in certain cases where other methods are insufficient, and to supplement other methods when it can be done to advantage. With this end in view, the diseases of insects are worthy of the most careful study, and will not, he thought, disappoint the investigator in their final results.

Mr. Fletcher thought that the chief difficulty with regard to these fungus diseases was their cultivation so that they might be available at the time when needed. One trouble with him had been carrying them over the winter.

Prof. Hargitt spoke of a fungus disease which had attacked the canker worm.

Prof. Cook thought the greatest difficulty in making use of contagious diseases for the destruction of insects was the fact that the insects which it was desired to treat were not always in a susceptible condition.

Prof. Garman thought that although fungus diseases were difficult to introduce, bacterial diseases would probably be more controllable.

The meeting adjourned till 5 o'clock.

VARIOUS INSECTS.

Prof. Atkinson spoke on the "Injurious Insects of Alabama." A bud worm had been extremely injurious to young corn, piercing the central shoot and destroying its growth. *Diabrotica L.-punctata* had also been injurious in the same manner; and, if there were not sufficient food in the stem, the larvæ descended to the roots and tunnelled out irregular channels on the surface. They pupated in the ground. A new attack had been observed on the "Irish potato," viz., by the Cabbage Plusia, which had attacked the leaves. The same insect had been very injurious to cabbages. In the southern part of the State more had been done by the Plusia than by the cabbage worm. At Mobile farmers had complained that 50 per cent. of their melons had been injured by a worm. *Scolytus rugulosus* had been very abundant at Auburn in the spring, attacking trunks which appeared to be perfectly sound. Onions had been badly injured by a species of Thrips. Another species had also been injurious to cotton plants.

Prof. Cook stated that he had also seen a Thrips injuring onions in Michigan.

Prof. Webster stated that he had studied *Scolytus rugulosus* and had found that it invariably attacked trees which were injured. In a single instance, where the beetles had commenced operations on a sound tree, he found that they afterwards left it.

Prof. Cook made some remarks upon the effect of mild winters upon insect presence. He had found cut-worms and saw-flies very abundant in Michigan during the present season. He had also bred a new borer from the black currant, i.e., the small longicorn beetle *Hyperplatys maculatus*. He had also found that the larvæ of *Argyria typuliformis* had been largely destroyed by a fungus growth like that of the white grub. The leaves of cherry, pear and quince had been badly attacked by the larvæ of saw-flies, but they had been easily kept in check by applications of road dust.

Dr. C. M. Weed presented a paper upon the "Oviposition of *Dectes spinosus* upon *Ambrosia trifida*." He also gave some account of the insect, in all its stages, from specimens which he had bred.

During the meeting a most interesting set of photographs was exhibited by Prof. Webster, showing a likeness of Thomas Say, his birthplace, the house where he lived during the greater part of the time he was writing his works, his tomb and an autograph. Prof. Webster had a few sets of the photographs struck off when his own were printed and is willing to let entomologists have them at the actual cost of production.

AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS.

The second annual meeting of the Association was held at Champaign, Illinois, in room 6 of the University of Illinois, beginning November 11th. The following officers and members were present during the meeting:

President, C. V. Riley, Washington; 1st Vice-president, S. A. Forbes, Illinois; 2nd Vice-president, A. J. Cook, Michigan; Secretary, John B. Smith, New Jersey. J. M. Aldrich, S. Dakota; W. B. Alwood, Virginia; G. F. Atkinson, Alabama; M. H. Beckwith, Delaware; James Fletcher, Ottawa, Canada; Lawrence Bruner, Nebraska; H. Garman, Kentucky; C. P. Gillette, Iowa; F. W. Goding, Illinois; C. A. Hart, Illinois; F. L. Harvey, Maine; L. O. Howard, Washington; John Marten, Illinois; Herbert Osborn, Iowa; F. H. Snod, Kansas; H. E. Summers, Tennessee; Roland Thaxter, Connecticut; F. M. Webster, Indiana; Clarence M. Weed, Ohio; C. W. Woodworth, Arkansas; E. F. Goff, Wisconsin.

Several others interested in entomology, not members of the Association, also attended the meeting, giving an average attendance of about 20 at every meeting.

The secretary read his report and submitted some letters for action by the Association.

On the motion of Prof. Cook it was decided that an assessment of 25c. should be made from each member attending the meeting to defray the necessary expenses.

The committee on co-operation (Profs. Riley, Cook, Forbes, Comstock and Lintner) reported progress and was continued.

The requisites of membership were discussed and Drs. A. S. Packard, D. S. Kellicott and Messrs. J. M. Aldrich, E. V. Wilcox, C. A. Hart and A. D. Hopkins were placed on the list of active members. Mr. E. W. Doran was elected an associate member.

The constitution was amended by striking out the provision allowing special meetings to be called at the request of members.

SECOND DAY'S SESSION.

On November 12th 29 members were present, including some ladies, and the Hon. Edwin Willits assistant secretary of agriculture for the United States. The president, Prof. Riley, delivered his annual address on "The Outlook in Applied Entomology." This address was a masterly effort and was intently listened to by all who had the good fortune to hear it. It will be published in full in the pages of *Insect Life*.

Mr. James Fletcher, of Ottawa, spoke in high terms of the paper. He said: "You have drawn our attention to the fact, Mr. President, that this is the most remarkable meeting of economic entomologists which has ever met together, and I feel sure, sir, that everyone present will agree with me that your address is one of the most remarkable we have ever had the privilege of listening to. You have covered so much ground and spoken upon so many subjects on which we know you to be the highest authority, not only from the exceptional advantages you possess from your official position, but also from the experience you have gained from earnest and close attention for a quarter of a century to this special subject which we have gathered together to-day to discuss, that if we heard nothing else we should be well repaid for the trouble of attending this meeting. This great knowledge makes you *facile princeps* the most eminent living economic entomologist—a title to which, on account of the work you have done in developing the science of practical entomology, no one will dispute your claim. The present meeting

being a joint one of the Association of Economic Entomologists and of the Entomological Committee of the U. S. Experiment Stations leads me to make these remarks, because probably the question which is most engaging the attention of many of us at the present time is whether any good purpose will be served by maintaining both of these organizations. We know that the Committee of the Experiment Stations must meet if the directors of stations order it; but I feel confident that the necessarily limited number of entomologists in that committee, even if every station eventually employs such an officer, cannot do such good work for the science and give them equal opportunities, to those offered by an organization of the nature of the Association of Economic Entomologists, which will include many eminent men who are excluded from active membership by the rules of the committee. I refer to such men as Prof. Riley and his assistants, Dr. Packard, Mr. French, Dr. Lintner, and hosts of other economic entomologists in the United States as well as the Canadian entomologists and many others who would be pleased to join in various parts of the world. I submit to the meeting that there is room for good work from both of these organizations and that it would be extremely ill-advised to let either of them drop to the ground for each should be of the greatest assistance to the other. I believe, too, that to no one can the Association be of more use than to the Experiment Station Entomologists, and therefore they should make every effort to sustain an association at the meetings of which they must always have greater freedom than they can have in the committee, where the proceedings will always be subject to a certain degree of restraint, both as to the time allowed for discussion and the subjects brought forward. The Entomological Committee is specially a meeting of the Entomologists of the Experiment Stations and any one else will always, to a certain extent, feel himself an outsider no matter how cordially the band of friendship may be extended to him. The president has stated that he does not care where the work is done so that it is carried on vigorously. This is probably the case, and the gentlemen I have mentioned have very little to learn from the meeting compared with the advantages which will accrue to us from having such men present at the meetings. I cannot help thinking that we shall make a serious mistake if we allow an organization to drop which will ensure us their sympathy, attendance and services and will at the same time form a bond of union between the economic entomologists of the whole world.

The address was also highly complimented by Prof. Cook, who spoke of the advantage of co-operation between the Association and the Committee of the Experiment Stations. He suggested some ways in which these two organizations could be mutually beneficial.

Prof. John B. Smith thought there was no necessity to have two bodies composed of nearly the same members meeting on the same days and at the same place and covering the same ground. He strongly advocated an effort being made to gain from the Association of Agricultural Colleges the same advantages for the entomological committee as were at present offered by the Association of economic entomologists. This, he thought, would be of advantage to station workers, at least, as it would give them a recognized place in the official body of Agricultural Colleges and Experiment Stations.

Dr. C. M. Weed thought that there was some misunderstanding as to the status of some of the gentlemen who had been mentioned. The Canadian Experiment Station was represented in the main body and its officers have the same rights and standing in committees as have those of the other stations. The Department of Agriculture is equally represented both in the main body and in the committees.

In reply to Prof. Smith, Mr. Fletcher said that there was no intention of always having the meetings of the Association of Economic Entomologists at the same time and place as the Committee of the Association of Agricultural Experiment Stations. The place of meeting would be decided annually. As to covering the same ground, if the Association of Economic Entomologists continued to exist, it would draw into its membership entomologists from all parts of the world while the committee could only contain the entomologists employed at the various experiment stations. In answer to Dr. Weed he was sure that others than experiment station entomologists would always feel themselves to a large extent outsiders.

Prof. A. J. Cook of Michigan, read a paper on "Work of the Entomologists in Experiment Stations," in which he gave his ideas of the manner in which bulletins should be prepared and detailed his own method of reaching the agricultural public.

There was an interesting discussion on these subjects participated in by Messrs. Woodworth, Harvey, Weed, Smith and Aldrich. Dr. Weed spoke of the plan of furnishing articles to the manufacturers of the plates known as "patent insides," which get a large circulation in rural papers.

Prof. Smith thought the best way to reach farmers was attending and delivering addresses at farmers' institute meetings.

There was considerable discussion as to the advisability of using old and well known information in bulletins. It was, however, generally conceded that this was necessary so as to make the bulletins of the greatest use to agriculturists. Frequently well known insects appear in destructive numbers and it is necessary to give their complete life history.

Prof. J. B. Smith spoke on "Fertilizers as Insecticides," giving his experience with Kainit, and mariate of potash. He spoke highly of their use against cutworms and species of aphides which worked beneath the surface of the ground.

Prof. Riley gave some of his experience with ashes and other materials containing potash. Mr. L. O. Howard read a valuable and extremely interesting paper on "The Habits of *Pachyneuron*," which demonstrated the good work which is being done by the entomologists of the Division of Entomology at Washington. The question of breeding these and other hymenopterous parasites was discussed by Messrs. Howard and Harvey. In answer to questions from Messrs. Harvey, Fletcher, Cook and Summers, Mr. Howard gave instructions as to the best method of rearing, mailing and mounting specimens.

Mr. Smith read some notes on the Plum Cureulio in which he gave the results of some observations upon eggs laid in apples. He found that the larvae came to maturity only in such fruit as fell from the tree. He was therefore of the opinion that it was necessary for it to be in a state of partial decay. He had found the characteristic injury and larvae of the cureulio in the young fruit of *Amelanchier Canadensis*. He pointed out the importance of collecting and destroying all fallen fruit.

This subject was spoken on by Messrs. Beckwith, Harvey, Gillette, Woodworth, Cook and Fletcher. Prof. Smith gave also "an experience with the Rosebug," giving an account of serious injury by this insect in Southern New Jersey during the past season. All remedies tried had proved of no avail on account of the enormous numbers of the beetles. He had used pyrethrum, copper fungicides, kerosene emulsion, tobacco, whitewash. The greatest measure of success had followed the use of a "sulphur soap." He believed the only remedy for grapes was to bag the bunches.

Messrs. Howard and Alwood made remarks on this subject and the meeting adjourned.

THIRD DAY'S SESSION.

On November 13, there was a morning meeting of the association; 21 persons present. The president announced that the first business of the meeting would be the election of officers for the ensuing year. The following were elected: President, Mr. James Fletcher, Dominion Entomologist of Canada; 1st Vice-president, Prof. F. H. Snow, Kansas; 2nd Vice-president, Prof. Herbert Osborn, Iowa; Secretary, Mr. L. O. Howard, Washington, D.C.

The advisability of all members of the association sending their bulletins to other members was brought up and there was a unanimous expression that this should be done. This will not only be a means of apprising each of what others are doing, but will act as a bond of union amongst the members of the association.

It was decided after some discussion to hold the next meeting of the association at Washington, D.C., beginning just before the meeting of the American Association for the Advancement of Science.

The constitution was amended by striking out the word "official" in the title, and an amendment was submitted abolishing the distinction between official and non-official members as to rights and privileges.

Prof. Smith read a paper entitled "Some questions relating to Aphides." Great stress was laid upon the value of the poriferous system of the antennæ of the winged forms in distinguishing species. Only by these characters could the adults of *Aphis mali* and *A. maidis* be separated. The poriferous system of a wingless viviparous female of any species was always like that of the larval form—from this Prof. Smith considered that the process known as "gemmation" was a case of true reproduction by larvæ.

The matter was discussed by Messrs. Webster, Howard and Osborn who agreed with this pretty generally accepted theory.

Prof. C. P. Gillette read a paper—"Notes on the Plum Curculio and Plum Gouger," in which he detailed his observations relative to the egg-laying habits of the two insects. Mr. Lawrence Bruner spoke on "beet-root insects." The increased area under sugar-beet in the State of Nebraska had rendered a study of the insects attacking this crop a necessity. He gave a list of all the species he had found attacking the plant.

Mr. Fletcher asked if any practical remedy had been devised for the Anthomyian fly which mined in the leaves of beets and mangolds.

None of those present had had any experience with the insect in injurious numbers.

Mr. Howard asked whether the European pest of the beet-root (*Silpha Opaca*) had been observed by Mr. Bruner or any one else as occurring in America.

Mr. Bruner had not noticed it.

Mr. Fletcher expressed interest in the life-history of the Collops beetles and asked if anything was known concerning them. He had only taken them when sweeping grasses. Prof. Smith had taken them on *Solidago*.

Mr. Smith related his observations on "an invasion by the Clover-leaf Beetle." This had appeared in great numbers in New Jersey during the summer but was entirely exterminated by a fungous disease.

Mr. Howard mentioned a similar attack in Pennsylvania where the insect had developed a fondness for timothy (*Phleum pratense*.) Specimens were sent to Washington and caged over this grass, upon which they were observed to feed.

Mr. Woodworth mentioned that he had observed in Arkansas three epidemics amongst insects which were so severe as apparently to exterminate the infested species: one of these was the tomato worm.

Mr. Fletcher asked whether *Phytonomus nigrirostris* had been observed as injurious to clover. He had frequently found the larva feeding on the heads of clover as well as the characteristic cocoons. He had found it in many parts of Canada, but upon one occasion, as recorded in his report for 1884, it was injuriously abundant at Dalhousie in New Brunswick. Mr. Gillette also spoke on insects injurious to clover.

Prof. Smith gave an account of some experiments with preservative fluids. He had found a mixture of equal parts of acetic acid and alcohol very satisfactory both in regard to preserving form and colour of delicate insects.

The subject was earnestly discussed by all present as being a subject of much importance. Mr. Woodworth gave as a method which he had found satisfactory for larva, to kill in water heated to 90° centigrade: leave from 1 to 5 minutes; then put in alcohol 35° 1 to 2 hours, 50° from 6 to 8 hours, 75° for 24 hours or more and then to absolute alcohol. This would usually preserve perfectly and was a recognized process for hardening and preserving for histological purposes.

Mr. Fletcher asked whether in the case of large larva it was necessary to puncture the epidermis so as to allow the preservative fluid to penetrate.

Mr. Woodworth answered that this was not often necessary.

Mr. Fletcher spoke of a large series of the larva of *Sphinx chersis* which he had taken during the past summer upon various species of *Fraxinus*. They varied so remarkably in colour that he was able to separate about 40 which showed different markings from the usual glaucous green to a rich vinous purple with yellow epidermal dots. He had placed them in a jar of 35° alcohol and had found that those at the top were very much discoloured and that those lower down were less so, those at the bottom being of good colour. On placing some in stronger alcohol the discolouration was intensified. He thought the discolouration was due to the gradual decay of the central portions of large larva, but could not understand why those at the bottom were less discoloured than those at the top of the jar.

Prof. Forbes stated that he used the method described by Mr. Woolworth in his laboratory and found it fairly successful. It does not preserve greens well, but browns are preserved and the markings are well shown.

Mr. John Marten said that hot alcohol was a convenient way of preserving specimens by this method and that it answered equally well as killing in hot water.

Prof. Forbes read a "Summary history of the corn plant louse." This was an intensely interesting paper and gave the results of continued observations for some years by Prof. Forbes and his assistants. It gave the life-history both above and below the ground. The relations existing between the aphis and the ants which were always found in company with it were explained and suggestions for remedies based on these observations were made.

The discussion on the paper was postponed until the next session.

At the afternoon session 18 persons were present. The president called for discussion of Prof. Forbes's paper. Messrs. Howard, Riley, Fletcher and Forbes discussed the points brought forward and the difficulties of getting at accurate and final results were brought out. The question of possible relationship between the apple plant louse and the corn plant louse was discussed by Messrs. Riley and Forbes.

Mr. Howard asked whether Prof. Forbes considered his experiments with the apple plant louse were satisfactory.

Prof. Forbes thought not entirely but they were the best they could do under the circumstances.

Mr. Fletcher asked whether the habits of different broods in species which migrated from one plant to another were not very different and therefore difficult to experiment with—as, for instance would the hop inhabiting form of *Phorodon humuli* live upon plum if placed there artificially and *vice versa*.

Prof. Riley thought it would not. It is very difficult to do artificially what nature does in her own time and in her own way. Sometimes an insect will not colonize upon a plant at a certain season, to which at another time of the year it migrates naturally. He asked if the experiments made upon the root forms were done carefully as there are many species which resemble each other which have root forms.

Prof. Forbes stated that great care had been taken in carrying out the experiments.

Prof. Forbes read a paper "On the life-history of White-grubs, with descriptions of new stages." Current mistakes with regard to the life-histories of these injurious insects were pointed out. Several species of *Lachnostenra* were observed to reach the imago state in the autumn instead of in spring as usually stated and the differences between groups of larvae were pointed out.

The paper was discussed by Messrs. Smith, Howard, Forbes and Riley, who confirmed many of the points made in the paper.

Mr. C. A. Hart read a carefully prepared paper on "The life-history of Wire-worms," in which he drew particular attention to distinguishing characters by which these larvae might be divided into groups.

The paper was discussed by Messrs. Cook, Gillette and Bruner.

Prof. Cook had found that one crop of buckwheat will not prevent injury the next year.

Mr. Fletcher gave some "Notes upon Injurious Insects of the year in Canada." Cut-worms of various kinds had been locally abundant. *Agrotis turris* had been destructive in gardens to flowers and vegetables. *Hadena arctica* and *H. derastatrix* had injured fall wheat and grasses in the spring. He was more than ever in favour of the poisoned trap remedy for cut-worms. *Agrotis fennica* had injured clover. The caterpillar of *Pieris rapae* had been very troublesome, but was easily destroyed with pyrethrum powder diluted with four times its quantity of common flour or slaked lime.

Plutella cruciferarum had also done much harm to cabbages in the North-west Territories and British Columbia. This is much more difficult to destroy with pyrethrum than the last named. The Cabbage Root-maggot had attacked cabbages severely, but had been successfully destroyed by syringing about half a cupful of hellebore tea round each root and then hoeing the soil well up round the stem. He had made some interesting studies of the Hessian fly which agreed in the main with those published by Prof. Forbes in a late bulletin. Spring wheat sown in the end of April had been attacked at the root in the same way as wheat is injured by the autumn brood. From the same wheat plants he had bred the Hessian fly, the Wheat Bulb-worm and *Oscinella variabilis*. Insects injurious to fruit trees had been represented by the Plum Curculio, the Codling Moth, the leaf roller of the apple and the Canker worm. All of these had been successfully treated with Paris green. Observa-

tions on forest insects had shown him that the large cerambycid larvae from eggs laid early in the season produced the perfect insects the next year; but those laid late passed two years before coming to maturity. He had taken a female of *Monohammus confusor* with the abdomen filled with eggs as late as the middle of September. The attacks of *Nematus erichsonii* on larches in the Provinces of Quebec and New Brunswick were described.

Prof. Webster asked whether *Agrotis fennica* had been observed feeding on cereals.

Mr. Fletcher had found that it fed primarily on clover, but when occurring in numbers is almost omnivorous. Asparagus beds, raspberries and strawberries were injured and some young forest trees grown in nursery rows and of various species had had the terminal buds destroyed.

Prof. Cook had found the larvae to eat everything. It had attacked blue grass and timothy severely. He was not positive about its attacking grain but believed it would.

Prof. Smith, speaking of the best way to use pyrethrum powder, said that he had found it most satisfactory in water.

Mr. Beckwith had found it could be used most satisfactorily with lime.

Mr. Fletcher asked whether the dry powder was not as a rule better than the water mixture. He had found it so in his experience.

Prof. Cook and Prof. Gillette had found it so also.

Prof. Summers found that the difficulty with water mixtures was to make them adhere to the plant: he asked whether the addition of soap would make them stick better.

Mr. Fletcher said it would on such plants as threw off liquids by reason of a waxy secretion on the leaves, as the cabbage, etc., etc.

Prof. Cook asked whether Mr. Fletcher still made up his cut-worm traps in bundles. He had found it most satisfactory to put a supply of poisoned vegetation on a platform waggon and then pitch it off with a fork.

Mr. Fletcher answered that he did and not only that but he found that it paid for the extra trouble to cover the bundles with shingles which kept them from drying up so soon. He warned those who advised this remedy to mention that the cut-worms do not lie under them in sight, but burrow beneath the soil and are not seen unless looked for. They sometimes wander off to a distance of two or three feet.

Prof. Cook confirmed this. He used clover largely. He sometimes sprayed a patch with poison as it stood and then mowed it and used it as traps.

Mr. Fletcher had found that clover was not the most satisfactory plant for him at Ottawa. It is frequently not far enough advanced in the early spring when needed and did not hold the poison well. He always recommended any succulent plant and was careful to tell farmers that they could use almost any weed growing about their fence corners. He had found *Lepidium Virginicum*, pepper grass, a very attractive plant. *Chenopodium album*, lamb's quarters, is also greedily eaten by cut-worms; but it is difficult to make the poison adhere to it. For such plants it is necessary either to dust them with dry powder after damping them or to rub up some soap in the water.

Prof. Cook had found mullein to be a most attractive plant for cut-worms.

The meeting adjourned to meet again next year at Washington.

KITCHEN-GARDEN PESTS AND HOW TO DEAL WITH THEM.

BY THE REV. THOMAS W. FYLES, SOUTH QUEBEC.

In writing on insect pests I have not hoped to tell of any new discoveries. My object has been to present in a concise form, for the use of husbandmen and housewives, such particulars as I have thought might be interesting and useful to them. I have wished to do my part towards the making of the annual reports of the Entomological Society of Ontario handy repertories of practical information.

I shall in this paper tell of kitchen-garden pests, grouping them as flies, lice, beetles, butterflies and moths.

FLIES (*Order, Diptera*).

THE RADISH FLY (*Anthomyia raphani*. Harris).—This fly appears in the end of June and the beginning of July. It is rather less than half an inch in expanse of wings. Its colour is ash grey. The wings are transparent with a yellowish tinge at the base. The halteres or balancers are yellow. The face is silvery. The eyes are copper-coloured. The insect lays its eggs on the stems of the radish near the ground. The newly-hatched maggots penetrate the swelling roots, enlarging their mines as they grow and filling them with *frass*, rendering the radishes quite unfit for food. When full grown the maggots leave the root and change to pupæ in the soil. The full grown maggot is about a quarter of an inch long, truncated at the end and gradually tapering to a point at the head. This is furnished with a pair of black nippers. At the truncated end of the creature may be seen the outer prolongations of the two main tracheæ, and round the edge of it a number of teeth or tentaculæ. The general colour of the maggot is shining white.

I have found that radishes sown on rich soil as soon as the frost is out of the ground—at Quebec, as soon as the snow disappears, that is to say in the beginning of May—will generally attain a growth of an inch and a quarter in diameter before they begin to show the operations of the maggot. I have this year made three sowings. The first, in May, was a success. Of the second, made early in June, about half of the radishes were fit for the table. Of the third, made in the end of the month, hardly any were eatable. They grew to a large size, but were bored through and through by the maggots. These were operating as late as October. On the 21st of November I had a number of roots dug up from under the snow. They contained no maggots, but showed recent traces of them and holes at the lower side where the creatures had made their exit into the soil.

The remedies that have been suggested against the radish fly have been such as by their foul smell are likely to drive the fly away, carbolic acid, gas-lime, etc. I have not much faith in such protectives. It seems to me that those who would raise late radishes must do so in frames covered, not with glass, but with fine netting fastened to slats.

THE ONION FLY (*Phorbia ceparum*, Meigen).—This fly (Fig. 11) also appears in June. It is ash-coloured and is set sparsely with black

hairs. It has an interrupted dorsal stripe on the abdomen. The wings are clear. It measures half an inch in expanse of wings, and a quarter of an inch in length of body. The mother fly

lays her white oval eggs on the edge of the sheath of the onion, near the ground, seldom depositing more than six on one plant. The eggs hatch in a few days, and the maggots, which in general appearance resemble those of the radish fly, work their way downward, inside the sheath, to the bulb. Having devoured one bulb they will pass on to another. They may often be found clustered on the outside of the bulb. It takes them a fortnight to attain their growth, and in another fortnight the perfect flies appear. While the onions are yet very young soot and wood-ashes should be scattered over the bed as a preventive, and

where the maggots are really working hot water should be applied to the bulbs with a watering can. This will destroy the maggots without injuring the plants.

For a more full account of this pest see Dr. Bethune's excellent article on "Remedies for Noxious Insects," in the Society's 19th annual report.

THE CABBAGE FLY (*Anthomyia brassicae*, Bouché).—The cabbage fly is ash-grey. The male has three black longitudinal lines on the thorax, a black dorsal line on the abdomen, and black bands at the edges of the segments. In the female the lines on the thorax and the bands on the abdomen are wanting.

The female fly lays her eggs at the junction of the lowest leaves with the stem. The larvae eat the rootlets and penetrate the main root and the stock. The plant speedily withers away. In wet seasons especially the insects are often very destructive.

It has been recommended as a preventive that, at the time of planting, the roots and stems of the cabbage plants should be dipped in weak lye of ashes. As a remedy Dr. Lintner tells us (1st Annual Report of Injurious and other Insects of the State of New York. p. 190), "Watering the plants with lime-water has been found to be of service in killing the larvae."

THE ROOT FLY (*Anthomyia radicum*, Linn).—The male of the root fly has the thorax on the upper side, marked with three black longitudinal stripes and three grey ones. The abdomen has a black dorsal line and is crossed with black lines at the sutures. The female is lighter in colour and much resembles *A. brassicae*, but it has three fuscous longitudinal lines on the thorax. She lays her eggs in the crown of the turnip or other root. These hatching, the ochre-coloured maggots work down into the bulb. When full grown they leave the bulb and pupate in the earth. The flies appear in the spring.

The use of superphosphate as a manure will preserve the turnips from the attacks of the fly.

THE BEET-LEAF MINER (*Chortophila betarum*, Lintner).—This is a small fly, expanding four-tenths of an inch only. The body colour is grey. The thorax has three dusky stripes. The wings have a brownish tinge; and the legs are black. It appears in June, and lays its beautifully reticulated eggs on the under

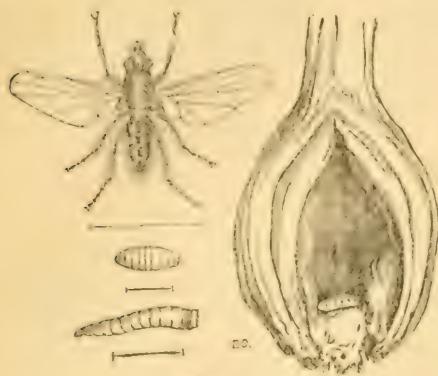


FIG. 11.

surface of the leaves. The larvae work in the leaf, between the upper skin and the lower, consuming the parenchyma. They are, when full grown, a quarter of an inch long, translucent in appearance, pointed at the head, which is furnished with black nippers, and truncated at the other extremity. To pupate they leave the plant and enter the soil. The pupa-case (puparium) is chestnut brown. From it the fly escapes in about twenty days. (See Dr. Lintner's 1st Annual Report on the Insects of New York State.)

The method of dealing with this insect is plainly to break off the affected leaves and to crush them under foot, or throw them into boiling water.

LICE (Order, Hemiptera).

THE BEAN LOUSE (*Aphis fabae*?).—A few years ago I found on some Mazagan beans that I was growing in my garden at Cowansville, a cluster of plant lice. They were lead-coloured and rather large. I had read of the marvellous increase of the *Aphis*, and I resolved to let these specimens on my beans live out their life and have their own way. The consequence was, that in a few weeks the whole row of beans—and it was a long one—was blackened with *Aphides*. This was quite in accordance with Reaumur's statement that one *aphis* can produce about 90 young ones, and that in five generations the increase from the one will amount to 594,900,000. As the season went on great numbers of the larvae of one or two species of Lady-birds (*Coccinellidae*) appeared on the scene and worked great havoc amongst the hosts of the enemy.

In dealing with a pest such as this, watchfulness and promptitude are required. The first clusters of the *aphis* should be picked off and destroyed.

THE CABBAGE LOUSE (*Aphis brassicae*, Linnaeus).—This insect is often very abundant. It is found on the under side of cabbage leaves, and has a whitish, mealy appearance.

Dusting lightly with flour of brimstone has been recommended as a remedy for it.

BEETLES (Order, Coleoptera).

THE COLORADO POTATO-BEETLE (*Doryphora decemlineata*, Say).—This, the well-known Potato-Beetle (Fig. 12) needs no description. Under its normal con-

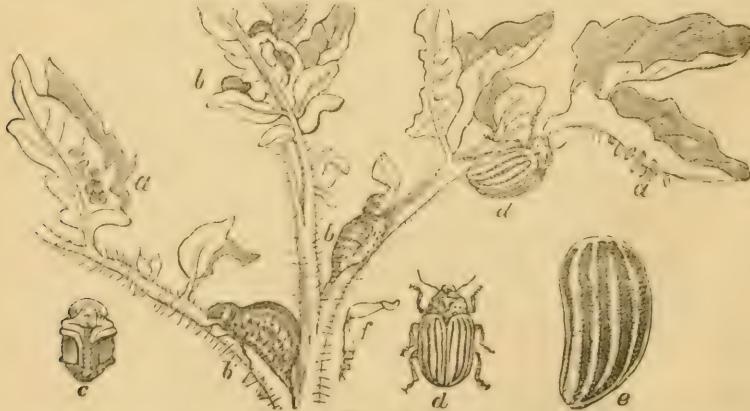


FIG. 12.

ditions, on the slopes of the Rocky Mountains, it fed upon the wild potato, *Solanum rostratum*. Access to the cultivated plant gave it that increase of vitality and fecundity which has rendered it so formidable a foe to the gardener.

Of the Solanaceæ, or Nightshade family, to which the potato belongs, there are in North America six genera, not counting the South American genus, Petunia, now so largely cultivated in flower gardens. They are (1) *Solanum*, Nightshade; (2) *Physalis*, Ground Cherry; (3) *Nicandra*, Apple of Peru; (4) *Hyoscyamus*, Henbane; (5) *Datura*, Thorn-apple; (6) *Nicotiana*, Tobacco. The first of these includes the potato, the egg plant, and the tomato, all of which are eaten with avidity by the beetle. When stinted of its favourite supplies, the insect turns to such other members of the family as may grow within its reach. The tobacco plant is attacked by it, and I have found it also upon *Physalis* and *Datura*.

It would seem that the forced vitality of the species is now diminishing. There is a narrowing down apparently, 1st, as to the number of broods, 2ndly as to the number of individuals. Professor Claypole, of Akron, Ohio, brought the diminution in the former case, under the notice of the American Association for the Advancement of Science, at the Minneapolis meeting. He said:—"This insect (the potato beetle) came as usual in middle Pennsylvania in the early summer. I was compelled to use poison as in previous years. In the latter portion of the summer I observed, and noted at the time in the *Canadian Entomologist*, that there was no second brood, or that it was so small as to pass unnoticed. It was my intention to watch in 1883 in order to determine if this second brood was again missing; but to my surprise, in 1883 there was almost no first brood."

In the neighbourhood of Quebec, late plowing, by disturbing their hibernacula, has destroyed great numbers of the beetles, and the lingering winter has retarded the appearance of the survivors, so that the first brood of the year has been both late and comparatively weak in numbers. For the last two seasons I have not had occasion to use Paris green on the early potatoes grown in my garden, but later-planted field crops have called for an application of the drug. The decrease in the number of perfect beetles appearing in the fall has been very marked.

THE THREE-LINED POTATO-BEETLE (*Lema trilineata*, Olivier).—This is a buff-coloured beetle, (Fig. 13) having three black stripes on the wing covers. Its

length is a quarter of an inch. It appears in June, and attacks the potato plants.

It lays its yellow eggs in small clusters, and in a fortnight the larvae appear (Fig. 14). They are of a dirty yellowish grey, and are generally seen with a thick coating of excrementa on their backs. This filthy covering is believed to serve for a defence against their insect enemies, and as a protection also from the heat of the sun. In about another fortnight the insects bury themselves in the ground and form cysts in which to undergo their pupal change. In a fortnight more the perfect beetles appear and lay their eggs for a second brood.

Paris green applied in the usual way is the remedy for these pests.

THE CUCUMBER BEETLE (*Diabrotica vittata*, Fab.).—The cucumber beetle is about two lines in length. It is yellow, and has a black head, and three black lines running along the wing-covers. The larvae feed on the roots, and the perfect insects on the tender leaves of the cucumber, melon and squash.



FIG. 13.



FIG. 14.

To destroy the larvæ water the plants with soapsuds, and to check the operations of the beetle sprinkle the leaves with hardwood ashes.

THE STRIPED FLEA-BEETLE (*Haltica striolata*, Illiger).—This minute beetle (Fig. 15) is black, with a buff stripe on each wing cover. It is beautifully formed, highly polished and very lively. It hibernates in the imago state, and comes forth early in spring to lay its eggs, and to enjoy itself at the gardener's expense. Its favourite food plant is the turnip.

Lime water has been used successfully against its English congener. To disappoint the "flea" sow late.



FIG. 15.

THE ASH-COLOURED BLISTER-BEETLE (*Macrobasis unicolor*, Kirby).—In the Eastern Townships the Windsor beans and potato vines are often infested with an ash-grey beetle of about three-fifths of an inch in length. The ash colour is owing to a soft down which rubs off leaving the surface black. This beetle is one of the Cantharides, and is as efficacious for medical purposes as the "Spanish Fly." It may be easily shaken into a pan of scalding water, and afterwards dried for medical use.

BUTTERFLIES AND MOTHS (Order, Lepidoptera).

THE CABBAGE BUTTERFLY (*Pieris rapæ*, Linnaeus).—That destructive pest the cabbage butterfly (Fig. 16 the male, fig. 17 the female) was first taken in Canada by Mr. Wm. Couper of Quebec. This was in 1860. The insect had probably been cast upon the shores of the St. Lawrence in the larval or pupal stage, with refuse cabbages from the steamships. We are indebted to Mr. Scudder for a full and most interesting account of the after progress of the species on this continent. From this account it appears that in 1866 it had spread to Cacouna, where it was taken by Mr. Saunders, to the Eastern Townships, where I captured it myself,

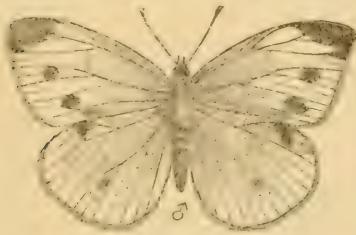


FIG. 16.



FIG. 17.

and into the State of Maine. In 1867 it reached Montreal. In 1868 a fresh importation by way of New York was made. The story runs that a German naturalist in that city obtained chrysalides from Europe, and that the imagos issued from these during his absence, and escaped through an open window. The insects spread in ever widening curves, both from New York and Quebec, till, in 1871, the two hordes met. In 1876 they had spread over the whole of Western Ontario. In 1881 they covered the country from the seaboard to Texas, Kansas, Nebraska, and Lake Superior; and by 1884 they had been met with on the shores of Hudson's Bay and at the foot of the Rocky Mountains.

Pieris rapæ may be readily distinguished from the less common native white (*Pieris oleracea*, Harris) by the black spots upon its wings. The female may be constantly seen in the summer months hovering over the cabbages, curving its abdomen and attaching its eggs dispersedly upon the plants. The larvæ are green irrorated with black. They have the habit of lying along the ribs of the leaves where they are not readily seen.

Dr. Lintner recommends sprinkling with water heated to 130 Fahr. and upwards (1st An. Rep. p. 59).

THE CABBAGE PLUSIA (*Plusia brassicae*, Riley).—This insect has at length invaded the Province of Quebec. It has been taken at Metis by Mr. Winn. Its numbers will probably increase. The fore wings of the moth are brownish grey, and have yellowish, indistinct, transverse lines. In the centre of each fore wing is a silvery, horse-shoe-like mark, with a silvery spot beyond it at the lower side. The hind wings are yellowish, with smoky hind margins. The male moth is furnished with conspicuous abdominal side tufts of a golden hue.

The larva is a half-looper, having only twelve legs. Its head is small and flat, and the body is gradually enlarged from it to the anal segment, which appears as if abruptly sliced off. In colour the caterpillar is translucent pale green, marked with delicate longitudinal white lines, and with white spots. In each of the latter is set a short dark hair.

The pupa is of a pale colour, yellowish or green, and is enclosed in a slight cocoon.

Besides the cabbage, the turnip, lettuce, celery and tomato afford food for this pest.

An application of hot water as recommended in the previous case, is probably the best remedy for the assaults of the insect.

THE CUT-WORM MOTHS.—These are a numerous family, including species belonging to the genera, *Agrotis*, *Mamestra*, *Hadena*, etc. They may be grouped as *climbing* and *surface* cut-worms. It is with the latter I am for my present purpose, more particularly concerned. I shall give a short account of a few representative species of these, and for further particulars would refer the reader to a valuable paper written by the late Mr. G. J. Bowles, which may be found in the Society's Annual Report for 1879.

THE DEVASTATING DART-MOTH (*Hadena decastriæ*, Brace).—This moth is one and three-fourths inches in expanse of wings. The fore wings are dark brownish gray, and have several whitish transverse lines. Near the hind margin is a row of arrow-headed black spots pointing towards the base of the wing. The hind wings are light brownish grey. The thorax is dark grey like the fore wings and the abdomen is of the same colour as the hind wings.

The caterpillar, (Fig. 18) known as the "Glassy Cut-Worm," has a translucent glassy-green body, a Venetian-red head, and a dark-brown cervical shield. It has a few scattered spots on each segment—each spot being furnished with a single hair. The caterpillar hibernates in the soil, and, coming out early in the spring, commences its destructive work upon the newly-planted cabbages. It feeds only at night, and lies hid in the soil, near the root of the plant, during the day.

THE BARRED-ARCHES MOTH (*Hadena amica*, Harris).—This beautiful moth expands about two inches. The ground colour of its fore wings is rich Spanish brown. Near the hind margin is a broad, wavy, bluish-grey band, and near the base of the wing is a narrower and darker wavy band. The reniform stigma (kidney-shaped spot in the middle of the wing) is large and distinct. The hind wings are ash-coloured, clouded on the outer margin.

The caterpillar which is called the "Yellow-headed Cut-worm," is of a smoky-brown colour, and the head, cervical shield, and anal plate are yellow, or chestnut-coloured. This creature cuts off the young corn *below* the surface of the ground.

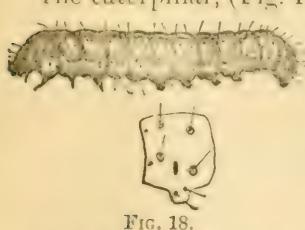


FIG. 18.

THE LANCE RUSTIC MOTH (*Agrotis tenuifera*, Harris). (*Ypsilon*, Rott).—Harris was the first to describe this fine insect, which measures an inch and a half in expanse of wings. (Fig. 19.) The fore wings are brown, dark along the costa and through the middle. Near the hind margin is a light-brown band, and at the base of the wing is a light-brown patch, shaped like the head of a fish with the mouth open. Pointing outwardly from the reniform stigma is a black lance-shaped mark. The hind wings of the moth are pearly white shaded with brown.



FIG. 19.

The caterpillar known as the "Greasy Cut-worm," is dull leaden brown, spotted with shiny black. Its dorsal and side lines are yellowish. The creature is highly destructive to corn, tobacco, tomatoes, etc., cutting the plants an inch above the ground.

THE CLANDESTINE OWLET MOTH (*Agrotis clandestina*, Harris).—In expanse of wings this moth measures an inch and three-quarters. It is a very sober-coloured moth. The fore wings are dark ashen. In them the orbicular and reniform stigmata are connected by a black line. The hind wings are dirty brownish-white, darker towards the hind margin. The fore part of the body is chestnut brown. The moth received its name from its retiring habits and attempts at concealment.



FIG. 20.

The caterpillar (Fig. 20) is called the "W-marked Cut-worm." It is yellowish grey in colour, lined with yellow, and finely sprinkled with dark spots. On each side of the back, upon the abdominal segments, is a row of black velvety marks. These marks, when viewed from the front, are suggestive of the letter W—hence the common name of the creature.

Nothing in the way of vegetables seems to come amiss to this cut-worm; beans, young corn, cabbage, pumpkins, etc., all are eagerly eaten by it. It has the habit of dragging its food under stones or into the ground, that it may feed upon it at leisure.

The methods to be pursued for protecting garden crops from the cut-worms appear to me to be these:—Because the caterpillars pass from plant to plant over the surface of the earth, and will not ascend a friable mound *corn should be planted in the hill.* Around each newly-planted cabbage a ring of salt should be placed, a few inches from the stem. The larya will not pass over this, and the salt will act as a fertilizer. Whenever a plant is found to be nipped off, the cause of the damage should be dug for at the root with a knife or pointed stick, and when found, destroyed. Growing corn, cabbages, cauliflowers, tomatoes, etc., should be earthed up several times during their period of growth.

"The Husbandman's Own Insecticide." Take plants of "poison poke," (*Veratrum viride*, Aiton) roots, stems and leaves, cut them into manageable lengths, make a decoction—a sap-kettle will be useful for the purpose—let the liquor cool, and then apply with a sprinkler or water-can. This will be found useful where the application of Paris green would be dangerous.

The gardener has a multitude of insect foes to contend with, but prompt and intelligent applications of preventives and remedies are very sure to be rewarded with success against them.

AN OUTBREAK OF THE ARMY WORM IN MARYLAND.

BY J. ALSTON MOFFAT.

It is seldom that we get an account of a remarkable occurrence in any department of life from a reliable eye-witness so competent to convey to others the facts seen by himself as is to be found in the following extracts taken from the report given by Mr. W. H. Ashmead to the United States Government, through the Entomological Department at Washington.



FIG. 21.

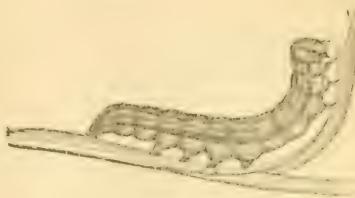


FIG. 22.

Although *Leucania unipuncta* (Fig. 21, the moth; Fig. 22, the caterpillar,) is a permanent resident in Ontario, and is frequently found quite abundant, it has never been reported as attracting special attention from its destructive effects on farm products here; and yet there does not appear to be any reason why it may not at some time do so.

The army worm has caused great loss in the Maritime Provinces, whilst in New York State and Massachusetts, where the climatic conditions must very closely resemble our own, it has been at times particularly destructive, whole fields being utterly ruined by it. Mr. Scudder made a calculation from what he saw, that there must have been at least two million worms to the acre, destroying an entire field in ten or twelve days. Therefore Mr. Ashmead's vivid description of the tremendous power of a combined attack of these despised creatures, should arouse those interested to the terrible possibility that may be awaiting them, and to guard themselves as much as possible against it, for it is a well known fact that slovenly farming is a great source of encouragement to all kinds of pests.

The army worm had a public reputation long before the moth, which gave rise to the destructive horde, was certainly known to be the parent of all the mischief. It was about the year 1861 that the late Prof. Fitch unmistakably traced the connection between the two, and since then, by the careful industry of others, its life history has been well worked out, but previously many unfortunate moths had to bear the blame for that of which they were not guilty; and even yet the justly dreaded army worm is at times reported to have made its appearance and causes great consternation in a locality, where, if the nature and habits of different insects were better known, it would be readily seen that the army worm, at any rate, was not to blame, and that the fright had been caused not so much from the attack, as from a want of a knowledge of how to distinguish between things that differ. If this had been possessed there might have been ample evidence to show that there was no cause for alarm, as it was not in the nature of that particular form to do any injury.

On one occasion I had an opportunity of witnessing an occurrence which forcibly illustrates this very condition of things. I had gone on a visit to the country about the end of wheat harvest, when a hot and dry spell was prevailing and all vegetation was more or less, exhibiting the effects of it, by a rusty tinge

to the green. Amongst the first things that I heard of was that the whole locality was overrun by the army worm, that they had eaten up every green thing and were now devouring the Canada thistles for want of something better, and whatever was to become of the crops next year they did not know. On the first opportunity I made personal observation—sure enough the thistles gave ample evidence that they had been previously ill-used, many of them with every leaf gone and nothing but the bare stem left, and caterpillars everywhere. In one locality where the road allowance ran between two farms with snake fences on each side, there was, on the one hand, an old pasture field, very brown and desolate to look at, on the other was a summer fallow, which had in places a luxuriant growth of Canada thistles, and I saw the worms crossing the road, in single and double file, in columns and squares, platoons, companies and battalions of them, and a toilsome march they had of it, especially when crossing the road-bed, which was deep with hot dust, leaving the dried up pasture field and all making direct for the fallow, apparently with a full knowledge of the fact that there was food to be got when they reached it; and I observed that the thistles in the fallow were being visibly reduced day by day. But it turned out that this all devouring host which had been causing such consternation in that locality, was composed entirely of the larvae of *Pyrameis cardui*, or the thistle butterfly; and no doubt but they had rigidly confined themselves all the time to their own natural and proper diet. In due time they disappeared and nothing was heard of them afterwards.

The following is Mr. Ashmead's account of the outbreak of the army worm above referred to :

In accordance with Professor Riley's instructions, on May 31, accompanied by Mr. Albert L. Hayward, of the Maryland Agricultural College, I started for Salisbury, Wicomico County, and Princess Anne, Somerset County, Md., to make such observations on the army worm (*Leucania unipuncta*), then depredating in the vicinity of these places, as the limited time at our disposal should permit.

During our journey we ascertained, in conversation, that the worms were most numerous in the immediate vicinity of Princess Anne, and we took the most direct route for that place.

As we approached our destination we began to see the effects of the worms' work; just before entering the town we passed by a large field of corn, owned by Mr. H. H. Deshields, containing about twelve acres, that had been devastated by them, and only a few green plants could be detected here and there in the field.

This field was in marked contrast with another corn-field adjacent, which had been saved from attacks by ditching, as recommended in the third report of the U. S. Entomological Commission. Another thing observed was that this field was flanked behind with a wood that evidently prevented their ingress that way, whereas the former was contiguous to grass and wheat fields, in which the worms are said to originate.

Just before entering the town we passed another ten-acre corn-field, owned by Mr. John L. Lormer, that but a short time previously presented a most promising appearance, but which to-day is completely "cleaned out" by the worms. It may be worthy of record, as the theory has been advanced that insects originate in just such places, that in an adjoining field were three old hay-stacks. Contrary to our expectations we found the reports of their numbers not at all exaggerated, and the damage done is even worse than we anticipated—the wheat, corn, barley and timothy of many of the farmers being totally ruined by them.

One of the most interesting places for observation we visited was that of Wm. J. Porter, a practical and energetic farmer, who, although he has fought the worms most vigorously, has suffered severely from their attacks. By means of ditching and by burning straw, he has been able to save part of his crops, but several of his fields of corn, timothy and wheat, were already ruined. He reported the worms much less numerous than they had been, but we saw many thousands in his fields.

During our rambles Mr. Porter took us to one of the ditches he had dug to keep the worms out of a large corn-field. In this ditch he had sunk every two or three yards apart, deeper pits, where we found the worms two and three inches deep, and the rest of the ditch was black with the dead and living worms. From the dead a fearful stench arose in such strength as to attract the buzzards, which, as we viewed the scene, were proudly sailing overhead.

Mr. Porter informed us that the worms always originated in the wheat and old grass-fields, and during the morning hid themselves from observation, never appearing in numbers until after 3 o'clock p.m., which accorded with our own observations and with those of the other farmers visited.

They ate up the timothy and corn clean, and after devouring the blades of the wheat congregated, three or four together, on the heads; after devouring several of the lower grains they ate the husks and nipped off the upper portion of the kernel of the rest, thus almost entirely destroying it. If the grain is well advanced and somewhat hard it escapes destruction; but as most of the wheat visited was still in the milk the destruction was great, and not less than 75 per cent. of the crop had been already destroyed.

Although several parasites are known to prey upon the worms, and we kept a sharp lookout for such, none were seen except a few cocoons of an *Apanteles* which were discovered, together with the worms, under old trash and logs in a wheat-field. A few were gathered and forwarded to the Department, some of which have since hatched, and proved to be *Apanteles militaris*, Walsh.

On a neighboring farm, owned by Mr. Z. Rouch, almost as much damage had been done by the army worm as on the former place. A large corn-field and a field of timothy were totally ruined. A wheat-field, farther advanced than that of Mr. Porter's, was less seriously affected, although it did not escape entirely, the blades of the wheat and the young timothy being entirely eaten up by them.

It was on this place that we saw the effects of the worms on barley. Quite a large field already in head was completely ruined.

In the afternoon we visited probably the largest farm in the county, that of the Hon. D. N. Dennis, comprising 500 acres or more.

No better place existed for the proper study of the pest, as the worms were swarming in all the fields by the millions, and we had hit upon the proper time of day to see them most advantageously, 4 o'clock p.m. The ground was literally black with the crawling worms. Mr. Dennis had made no special efforts to destroy them, although, like some of his neighbours, he had surrounded some of his fields with ditches in an attempt to keep them out of adjoining fields. I believe it would have been quite practicable to have destroyed many thousands with poisonous washes, or, as Mr. Potter did, by burning straw in the ditches, as the bottom of the ditches were black with worms.

This farm is divided by a central lane, on either side of which are fields of wheat, corn, grass, oats, etc., and in passing through this lane we found the worms quite plentiful, crawling almost invariably in the direction of the prevailing wind.

One of the first fields we passed was an immense wheat-field already in the head, and the worms could be plainly discernible on the ground all through it and on the stalks and heads. The worms having already devoured the young timothy and other tender plants usually found growing there, the blades of the wheat, the husks, and a goodly portion of the kernels, evidently could not find sufficient food and were now migrating to pastures new, the sides of the field being black with moving hosts seeking more nutritious food.

These, as well as all the others observed, were moving in a south-westerly direction, the direction of the prevailing wind. They were apparently in all stages of growth, from little fellows not more than a quarter of an inch long to the fully matured larvæ, and all got over the ground and every obstacle in their way with the most surprising rapidity. The fences, posts, and other obstacles in their way were no obstruction to their migratory instinct, or their search for food. The fence rails and posts were often covered with crawling worms, sometimes not less than a dozen worms being found on the top of a single tall post, while others were seen going up on one side as others were going down the opposite. Some specimens were even found under the loose bark on the posts and rails, where they had probably crept for shelter. One specimen thus found was in the jaws of a large hairy spider, *Salicus* sp.

Adjacent to this wheat-field was a large field of timothy, containing 17 acres, the blades of which had been cut off by the worms as clean as cattle could have done. Mr. Jones, the overseer, informed me this field would have harvested not less than three tons of hay to the acre, but now it would not pay for the cutting.

At one side of this field, the side next the wheat, the worms had congregated in countless numbers, every square foot having not less than 30 to 50 worms. The worms were now coming out of this field and going into the adjoining wheat-field and crossing the lane into the opposite fields in great numbers, and it was here that we observed a flock of the common English sparrows and a few robins picking out the smaller worms and feeding on them. Mr. Jones informed us the English sparrows had been thus busily engaged all the past week, and it gives us pleasure to record here this fact in favor of the despised bird.

Some distance off from this field was another one of wheat, containing probably 20 acres, in which the worms were even more numerous, and they had already sufficiently injured it to render the crop unprofitable to harvest. A deep, broad ditch had been dug along one side, and it was now, about 5 o'clock p.m., black with worms. It seemed to us a pity that these worms were not killed, as many of them were able to crawl up the sides and escape into adjoining fields.

Facing this field was a large corn-field of probably 75 acres, of which 50 acres had already been destroyed, and there was but a slight chance that any of the corn still left would escape, although by ditching an effort was being made to save it. Of the 50 acres destroyed 30 acres had already been replanted, and in the newly plowed portion the worms were seen moving about in all directions, having just entered it from the adjoining wheat; it is probable that most of these will die of starvation or from the effects of the hot sun in the middle of the day.

TORTOISE BEETLES.

BY F. B. CAULFIELD, MONTREAL.

The tortoise beetles as they are called, from their resemblance in shape to a turtle or tortoise, belong to the great family of leaf eating coleoptera, the *Chrysomelidae*, but were formerly classed as a distinct family, the *Cassididae*, a term signifying a helmet, the fore part of the thorax generally projecting over the head like the front of a helmet. In the members of this family the body is generally of a broad, oval form, flattened beneath, convex above. The antennæ are short and thickened at the tip, presenting somewhat the appearance of a club. The head is small and generally hidden beneath the overlapping edge of the thorax, and the legs are very short, not extending much beyond the margin of the wing covers, so that the resemblance to a tortoise is really striking. The larvae of many kinds of insects are protected from the burning sunshine and the attacks of their enemies by a coat of hair or prickly spines, or else conceal themselves beneath leaves or in crevices during the hotter parts of the day, but the insects in question adopt an entirely different plan, and shelter themselves beneath umbrellas, covered, not with silk or cotton, but with a mass of their own excrement.

In most of these creatures the body resembles the perfect insect in shape, being broad and flattened, but they differ in having a row of spines on each side and in being provided with a tail, and a very remarkable tail at that. This instrument resembles in form a fork, with a rather thick, rounded handle, from which project two long prongs. This forked tail is curved over the creature's back, and upon the prongs and lateral spines the excrement is heaped until a mass almost as large as the creature's body is accumulated. Our Canadian species of tortoise beetles belong to three genera—*Physonota*, *Coptocephala* and *Chelymorpha*. *Physonota helianthi*, Rand, lives on the wild sunflower (*Helianthus*), and soon after these have leafed out in spring, such of the beetles as have survived the winter gather upon them. They are now of a bright, golden-green colour, and are exceedingly beautiful, gleaming and flashing like gems in the sunshine. Soon after this the eggs are deposited in an irregular cluster, covered with a gummy exudation which hardens on exposure to the air. This cluster is placed on the upper surface of the leaf, and near the tip just where it tapers to a point.

The larvae are oblong-oval in shape, and when full grown measure nearly an inch in length. The general colour is dark olive green, and on the back are three short yellow stripes, that in the centre being a little the longest. On each side is a row of ten simple spines. When undisturbed these slug-like larvæ keep the tail curved over the back, and both body and tail are constantly wet with semi-fluid excreta, so that the form of the creature can hardly be seen. From the middle of July to the end of August these larvæ change to chrysalids, and by the end of the latter month and during September the beetles emerge, and may be found resting quietly on the leaves of their food plant. They are now dressed in a coat of sober black, irregularly spotted with creamy white, very pretty little fellows in a neat evening dress, but very different to the magnificent marriage garment worn by their parents amidst the fresh green leaves and glowing sunshine of the early summer.

The beetles appear to eat very little, but the larvæ are hungry creatures, eating numerous holes in the leaves, and when abundant almost stripping the plants.

When young the larvae are of social habits, and huddle closely together, the heads all in the centre, surrounded by a ring of curled up tails, presenting a most curious appearance. When nearly full grown they separate and scatter over the plants, each one shifting for himself. The perfect insect measures about five-eighths of an inch in length.

The species belonging to the genus *Coptocycla* are smaller than *Physonota*, and differ somewhat in some of their habits. The eggs are deposited singly on the leaves, and when the larvae moult, the cast skins are slipped into the forked part of the tail, whereas the larvae of *Physonota* leave their discarded garments sticking to the leaves.

The golden tortoise beetle, *Coptocycla aurichalcea*, Fab. is very common on the Morning Glory, and often disfigures and injures it by eating holes in the leaves. They also attack the sweet potato. Prof. Riley states that they are often sufficiently numerous to destroy whole fields of this esculent, and they are especially severe on the plants when freshly transplanted from the hotbed. When freshly emerged from chrysalis the beetles are of a dull orange color, but in a few days this tint changes to bright gold color, when they present a most beautiful appearance as they glisten in the sunshine. The larva resembles the beetle in general shape, being broad and flattened, but on each side there is a row of sixteen barbed spines; it is of a dark brown colour, with a pale shade upon the back. Prof. Riley says that it carries its falcifork directly over its back, and the excrement is arranged in a more or less regular trilobed pattern.

The mottled tortoise beetle, *Coptocycla guttata*, Oliv., is also common on, and injurious to, the morning glory and sweet potato. It varies considerably in colour, some specimens being very dark—almost black, others are mottled with black and gold, and occasionally examples are found altogether of the latter colour. The larva is green, bluish on the back. Prof. Riley states that it carries its dung in irregular broad masses, often branching out into long shreds and ramifications.

Another species, the clubbed tortoise beetle, *Coptocycla clavata*, Oliv. is found on the true potato. It is given in the Society's list of Canadian beetles, but so far as known to me, has not been found in the Province of Quebec.

The "shell" of this species is thin and semitransparent, with patches of darker color, some of which extend to the margin of the wing-covers. I have seen no description of the larva.

Chelymorpha argus, Licht., is of a dull, yellowish-red colour, ornamented with nineteen small black spots, six on the thorax and thirteen on the wing-covers. It measures about three-quarters of an inch in length. Packard states that "the larva differs from that of *Coptocycla aurichalcea*, not only in its greater size, but the body is thicker and narrower, the head is freer from the thorax, and the spines are simple, not spinulated. The body is yellow and less protected by the cast skin. When about to transform the larva attaches itself to the leaf by a silken thread, a few segments from the end where the end of the body of the future pupa is situated. It is .45 of an inch long. The pupa is broad and flattened, dark and spotted with yellow, and covered with a whitish powder, causing the yellow portions to appear more prominently; along each side of the abdomen is a row of five spines, and there are four spines on the anterior edge of the prothorax; it is .40 of an inch in length." He further states that he has found it in all its stages on the silk-weed late in July and early in August, and in one instance in Salem it occurred in abundance on the leaves of the raspberry.

I have myself found it in all stages on the morning glory at Montreal some years ago, but have not met with it recently.

Tortoise beetles may be destroyed with Paris green, but as they often hide beneath the leaves, they are not so easily killed as the Colorado potato beetle. The plants should be closely watched when set out in spring, as at this time the beetles are comparatively few in number, and could be killed before the eggs are deposited, which would save much future trouble and expense. "An ounce of prevention is worth a pound of cure."

Tortoise beetles appear to be remarkably free from parasites. I have bred numbers of *Physonota helianthi*, but only raised one parasite, a small dipterous fly.

QUEBEC REPRESENTATIVES OF THE GENUS PLUSIA.

BY THE REV. THOMAS W. FYLES, SOUTH QUEBEC.

Following are the characteristics of the genus *Plusia* :—

Imago, antennæ setaceous, thorax and abdomen crested, fore-wings acute, curved on the hind margin, glossy, and often ornamented with metallic markings.

Larva, loops somewhat in walking, having twelve legs only; attenuated anteriorly; feeds exposed on low plants.

Pupa, inclosed in a slight cocoon.

Insects belonging to the genus *Plusia* may be readily distinguished by the conspicuous crest which they bear on the shoulders, the tufted abdomen, and the bill-hook shaped curve of the inner margin of the fore-wings. These are more or less striking in them all. Some of the species are very abundant, individuals of them may be seen in our gardens, even in the hot sunshine, hovering over the blossoms or passing from plant to plant with easy rapid motions.

The largest, and I think the most beautiful of our Quebec species is *P. ballucia* (Gey.) Fig. 23, which is one and three-fourths inches in expanse of wings. The splendid bronze-green of its wings, shining with the richest gloss of satin, will make it known to the veriest tyro in Entomology.

P. Putnami (Grote) may also be readily distinguished by its burnt-sienna coloured fore-wings with their golden apical streak, and their two central golden spots, sometimes united.

P. thyatiroides (Guen.) is very rare in the Province of Quebec. To those who are fortunate enough to meet with it, it may at once be known by the patches at the base and inner angles of its fore-wings, which are of a delicate pink, resembling in colour those on the wings of the English "peach blossom moth" (*Thyatira batis*). It is to these that the insect owes its name. The only specimen I have was taken at Cowansville in the Eastern Townships.

P. mortuorum (Guen.) also may be readily known. Its fore-wings are dark brown approaching to black. They are embellished with silvery lines and washes near the hind margin. Extending from the base to the centre of the wing are conspicuous plume-like silvery-white markings. This is one of the smallest species in the genus, expanding about one inch and a quarter.

The fore-wings of *P. ampla* (Walk.) are ash-brown with a rosy tinge. Extending from the inner margin to the middle of the wing is a well-defined dark-brown velvety patch, the inner side of which has a deep curve and is finely outlined with gold colour.

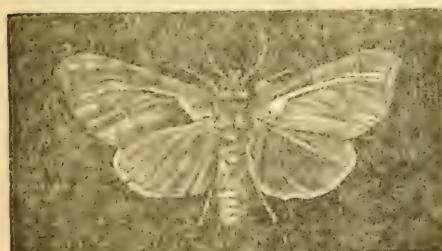


FIG. 23.

In *P. viridisignata* (Grote) the fore-wings are dark rosy-grey with numerous brown zig-zag lines. In the centre of the wing is an obscure bronzy-green figure, resembling a 3 or an 8 laid on its back.

One of the finest insects in the genus is *P. bimaculata* (Steph.). In expanse of wings it measures an inch and three-eighths. Its fore-wings are rich rosy-brown variegated with dark markings and with a patch of chestnut red in the centre. In this patch are two golden spots, the upper somewhat resembling the letter *v*. I have noticed that the Eastern Township's specimens of this moth are larger and brighter than the more northern specimens.

P. precationis (Guen.) is one of the most common species we have. Its fore-wings are of a rich purple brown with a golden sheen. They have a few pale wavy streaks, and a distinct silvery *y* in the middle of each.

In *P. simplex* (Guen.) Fig. 24 the fore-wing is of a dark ash-grey. It has a brown apical dash, and a brown shade on the inner margin. This shade is separated from the ash-grey base and basal portion of the costa, by a fine white line, which joins the inner arm of the silvery *y*-like central mark.

In *P. falcifera* (Kirby) the arms of the *y* are long and attenuated, and the tail lacks the terminal knob that is characteristic of *Precationis* and *Simplex*. *Falcifera* has rosy-brown fore-wings strikingly marked with curved and dentated rosy-white lines, having dark brown finer lines imposed. I captured several specimens of this insect at Como, P. Que. They were hovering over flowers on a sunny afternoon.

P. brassicae (Riley, Ni Hubn) has been taken at Metis, P. Que., by Mr.

Winn. This moth Fig. 25 expands about one and a half inches. It has dark greyish-brown fore-wings, with irregular, pale yellow cross lines, and in the centre a silvery *u* or horse-shoe like mark followed by an oval silvery dot. The underwings are yellowish clouded towards the outer edge.

Of *P. mappa* (G. & R.) only a few specimens have been taken in the Province of Quebec. The insect may be known by the numerous dark brown wavy lines upon its tawny fore-wings. In the centre of each of these wings is a silvery *u*, or horse-shoe-like mark, followed by a dot or annulet.

P. U-aureum (Boisd.) is a small species expanding one and one-fourth

inches. Its fore-wings are dark brown, and bear in the centre a golden or silvery mark resembling a squat capital *N*. On the fore-wings also are several irregular transverse golden or silvery lines.

Besides *Balluca* we have two species that have no metallic spots in the middle of the fore-wing, *P. area* (Hubner), and *P. areoides* (Grote). In the former the wings are dark brassy-brown and in the latter, pale brassy-brown. Both have darker transverse markings. *Areoides* has also, near the hind margin, a pale brassy transverse band.



FIG. 24.

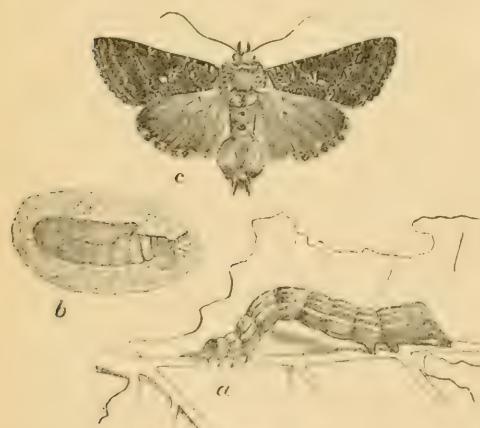


FIG. 25.

TABLE OF QUEBEC SPECIES OF THE GENUS PLUSIA.

I. Having white or metallic markings in the middle of the fore-wings.

A. Having y-like markings in the middle of the fore-wings.

- a. Having two golden marks as if the tail were cut off from the y.
- PUTNAMI, which has a *golden* apical streak.
- BIMACULATA, which has a *brown* apical streak.
- b. Having the y complete.
- 1. Tarsi of front legs banded brown and white.
- FALCIFERA, which has no knob at the end of the y.
- PRECATIONIS, which has the tail of the y knobbed.
- 2. Tarsi of the front legs plain.
- SIMPLEX.

B. Having markings of other forms in the middle of the fore-wings.

- a. Like *N.* U-AUREUM.
- b. Undulating, like a small snake. AMPLA.
- c. Like the figure 3 lying on its back. VIRIDISIGNATA.
- d. Plume-like. MORTUORUM.
- e. Like a small *v* followed by a dot or annulet.
- 1. Having pink spots on the wings. THYATIROIDES.
- 2. Having tawny wings. MAPPA.
- 3. Having greyish-brown wings. BRASSICÆ.

II.—Having no metallic markings in the middle of the fore-wings.

A. Having the wings glossy-green. BALLUCA.

B. Having the wings glossy-brown.

- a. Dark-brown. ÆREA.
- b. Light-brown. ÆREOIDES.

ORIGIN AND PERPETUATION OF ARCTIC FORMS.

BY J. ALSTON MOFFAT.

The subject of Arctic Forms is one of special interest in biology, and the frequent reference to it in natural history literature, keeps it constantly before the reader, and has made the theories concerning the origin and preservation of such forms well known, whilst to us as entomologists, it is of the very first importance in our efforts to obtain correct knowledge concerning the geographical distribution of insects. Grant Allen says.—

“On or near the summit of Mount Washington, a small community of butterflies belonging to an old glacial and Arctic species still lingers over a small area, where it has held its own for eighty thousand years that have elapsed since the termination of the great ice age. This same butterfly is found in two other localities on this continent; Long’s Peak, Colorado, is eighteen hundred miles distant; Hopedale, Labrador, is probably a thousand miles away; in the intervening districts there are no insects of the same species. Hence we must conclude, that a few butterflies left behind in the retreating main-guard of their race, on that one New Hampshire peak, have gone on for thousands and thousands of years, producing eggs, and growing from caterpillars into mature insects, without once affecting a cross with their congeners.”

I learn from the writings of Mr. W. H. Edwards, that the name of that butterfly is *Chionobas Semidea* (Say.) The description given by Mr. Scudder of its terrible struggle for existence, tends to arouse one's interest in it, and draws out one's sympathy for it, as we contemplate the dreary and joyless life it is doomed to lead in its inclement home, so opposite to what is considered to be the typical life of a butterfly. Grant Allen's conclusion is in perfect harmony with the theories prevailing on this subject, but there is another view that can be taken of it, which appears to me to be more in harmony with nature and observation, although it may spoil the romance, and give less play to the imagination; and that is the one contained in the well-known principle of the power of environment to modify the external appearance of living forms, and their ability to accommodate themselves to altered conditions.

To illustrate the principle that I wish to apply in this case, I shall draw upon Mr. Edwards's article on "Pieris Bryoniae and its derivative forms," to be found in *Papilio*, for June, 1881. He says:

"The species, of which *Bryoniae* is one of the forms, is known as *Napi*, having in Europe three manifestations, *Bryoniae*, *Napi*, and *Napææ*; the last of these was until recently regarded as a distinct species." Then quoting Dr. Weisman who says of *Bryoniae*: "This is to a certain extent the potential winter form of *Napi*. This type *Bryoniae*, in polar regions is the only form of *Napi*. *Bryoniae* produces but one generation a year, and must, then, according to my theory, be regarded as the parent form of *Napi*." He then states that in the Alps and Jura, *Napi* swarms everywhere, and crossing takes place, which causes variability in *Bryoniae*, but in Lapland *Napi* is never met with; so *Bryoniae* preserves its constancy, and concludes thus: "Pieris *Bryoniae* should be elevated to the rank of a species, and ordinary winter and summer forms should be designated varieties *Napi* and *Napææ*." Then Mr. Edwards, after a description of the markings of the various forms, says, "There are therefore the three forms under which the species manifests itself in Europe, *Bryoniae*, *Napi*, *Napææ*; of which *Bryoniae* may be considered the present form." Now to get myself into harmony with nature, I have to reverse this order. We all know that butterflies are lovers of the sun; and that they are most numerous in kinds and examples in warm countries where they flourish most luxuriantly, the conditions being more congenial to them. Therefore the natural inference is, that butterflies would first appear on this scene of life, in localities that were most favourable to them, and spread from these into those that were less so. We are all familiar with the restlessness of butterflies, and with what eagerness they will investigate every spot, seemingly with a determination to establish themselves there if possible; they succeed if the conditions are at all favourable, and some of them succeed even where the conditions are most unlikely. Now as *Bryoniae* is a darker form than *Napi*, and *Napææ* being lighter still, and taking the result of Mr. Edwards's experiments in this direction as a clue to some of nature's methods in this matter, which goes to show that cold has the effect of darkening the colour of some kinds, I infer that *Napææ* was the first to appear and to spread into a locality with a cold winter. This acting on the chrysalides, *Napi* appears as the spring form, and *Napææ* as the summer one. As the distribution goes on it reaches a yet colder climate, where *Napææ* disappears and *Bryoniae* is the spring form, with *Napi* as the summer one. Pushing yet onward it gets into a locality where the season is too short for two broods, when the single brooded Arctic and Alpine *Bryoniae* is alone to be found, and consequently constant, and there does not seem to be the slightest reason to doubt, that if every *Bryoniae* was swept out of Europe in one season, their place would soon be filled from the warmer

plains below, and that they would be just as true *Bryoniae* as those of the present — the result of the influence of climate on an impressionable organism, and the power of that organism to accommodate itself to altered conditions.

Now, then, let us return to our poor old friend *Semidea*, who has been having such a weary time of it on top of Mount Washington, for the last eighty thousand years. I do not know the form of *Chionobas* that flies on the plains of New Hampshire. I am dealing with one of the laws of nature that controls life, a far more reliable guide to correct conclusions, than the changeable external appearance of insects. But whatever they may be like, or by whatever name they may be called, I am quite confident, that upon investigation one of them will be found to stand in the same relation to *Semidea* that *Napi* does to *Bryoniae*, and will be found capable of pushing its way up Mount Washington and to be modified by the changed conditions, and by the time it has established itself on the top it has become true *Semidea*; so that if at any time *Semidea* had been obliterated from Mount Washington by the severity of the conditions, and it would seem little short of a miracle if it never has been, its place could yet be filled from below.

Then there is *Semidea* in the Mountains of Colorado. The *Chionobas* of the Colorado plains, will undoubtedly be different-looking from those of New Hampshire and discerned by bearing different names, and from one of them the *Semideas* have come which are found on the mountains; the same principle governing one as the other. We turn to Labrador and the same principle is at work there, only the conditions for the production of *Semidea* are obtained without the necessity for the elevation. So that from Labrador within the Arctic circle, to Long's Peak, Colorado, an unbroken chain of that species extends across the 2,800 miles that lie between, every link of which may differ somewhat from the one next to it, according to the conditions in which it lives, and be entitled to a distinguishing name, yet all united by the laws of consanguinity. At these three points, Labrador, Mount Washington and Long's Peak, Colorado, the conditions being the same, like results are produced and *Semidea* is the natural outcome. And according to Mr. Edwards, when specimens are brought from these widely separated localities and compared, they are not known to differ by a scale or a hair. I see that Mr. Seudder does not consider the Labrador form quite the same as the others, if so it would indicate that the conditions are not quite identical.

Mr. Edwards inform us that the *Satyrinae* are a very numerous family, with many genera, these having numerous species, which I take as an indication that they are sensitive to external influences and readily modified thereby, and probably a full series might exhibit the gradations to be slight.

This, then, is the view I take of the way in which Arctic forms have been originated and perpetuated, and the principle at work in producing them is that which has been so carefully elaborated with such a wealth of illustration and knowledge of facts by Wallace, in his *Island Life*; only he calls the forms produced by changed conditions "species" instead of varieties of a species, a mode of using the term that is ever liable to lead to confusion and misunderstanding.

FULLER'S ROSE-BEETLE.—(*Aramigus Fulleri*, Horn).

BY JAMES FLETCHER, OTTAWA.

From time to time complaints come to us of injuries done to greenhouse plants by some insect which gives abundant evidence of its presence, by the nibbled state of the leaves; but which is seldom detected. When such complaints are received, it is suggested that a light be taken into the greenhouse and search made at night. In most instances the culprit is found to be a small brown snout-beetle, shown at Fig. 28. This is known as Fuller's Rose-Beetle. There is no doubt that this insect is far commoner than is generally supposed. Its habit of feeding at night and hiding during the day time, added to the protection afforded it by its colour, saves it from detection until it attracts notice by its excessive numbers.

This is a comparatively new enemy, having only been described in 1876, when Dr. Horn named it after Mr. A. S. Fuller, who first brought it to his notice. It had however, been sent to Dr. J. A. Lintner, State Entomologist of New York, two years previous to that date.

A good deal has been written in different journals and reports upon the best way to overcome this pest; but it still keeps turning up in new localities every year, and is now reported as a greenhouse pest from the Atlantic to the Pacific coast.

Accounts of its life-history and habits are given in the Annual Report of the United States Entomologist for 1878, and Dr. Lintner's report for 1885. From these accounts we find that this insect injures greenhouse plants of many kinds; but its favourite food is undoubtedly the rose, and after this perhaps various

kinds of lilies. The injury done by the mature beetle is however slight, compared with that of the larva (Fig. 26), which is a thick white legless grub, when full grown $\frac{1}{4}$ of an inch in length, the body curved, wrinkled above and flattened below, covered with short tawny bristles. Head yellow with dark, black-tipped, sharp mandibles, with which it consumes the young rootlets of various greenhouse plants, and by the destruction of these fibres with which the plant takes its

food, soon destroys the vitality of the plant. Prof. Riley says:—(Ann. Rep., 1878, p. 256). “The most serious injury is done by the larvæ, which feed principally upon the more tender rootlets and thus attack the plant in its most essential parts. I have had a quite healthy rosebush totally destroyed in three weeks' time, by about three dozen of the larvæ, which were placed in the pot containing it.” When plants are attacked at the root by larvæ they have generally a characteristic appearance. The new wood is weak and spindly, the colour is unhealthy and very few flowers are produced. When this is the case they seldom recover. I have seen plants of which every one of the young rootlets were destroyed, and which threw out new roots close to the surface; but these never did much good, and florists tell me that it pays better to throw away such plants and replace them with young, vigorous bushes. There is frequently much carelessness amongst florists in not appreciating the serious nature of an introduction of this pest into their premises, and it is not at all uncommon to see plants destroyed by the larvæ, simply pulled out and other healthy plants set in the same soil. This of course is a great mistake, and is a practice which should never be followed. When roses are grown under glass in the usual way, viz.:—in beds, if the soil is found to be infested by the larvæ of this insect, it must all be



Fig. 26.

removed and fresh soil put in its place. There are several instances on record of rose-growers having given up the cultivation of this queen of all flowers, on account of the attacks of this insect; but this is not necessary, if they will learn something of its life-history and apply remedies accordingly. Prof. Riley has worked out the life-history and finds that the eggs are laid in flattened batches of from 10 to 60, the individual eggs being smooth yellow and ovoid and about one millimetre in length. They are laid by the female at the base of the plant just above the ground, and are generally pushed between the loose bark and the stem or are laid between the earth and the main stem, just at the surface of the ground. They are so firmly glued together and to the place where they are deposited that they can only be detached with difficulty. After about a month the eggs hatch and the active little larvae at once burrow down into the ground and begin their work of destruction. When full grown they turn to pupæ, Fig. 27, from which the mature beetles emerge in about three weeks. The perfect beetle, Fig. 28, is a brown weevil, a little more than $\frac{1}{4}$ of an inch in length, with a short thick snout and long slender antennæ or feelers, bent abruptly in the middle. The wing-cases are indistinctly striate, and bear rows of large punctures and minute hairs. A whitish stripe runs along the sides of the thorax and half way down the sides where it terminates as an oblique white dash, reaching to the middle of each wing-case. Prof. Riley says: "The parent beetles, like most other snout beetles, live for a



Fig. 27.

considerable time, as I have kept them in confinement for nearly three months. They are nocturnal in habit, being quite active and feeding only after dusk. They shun the light during day-time and hide under the leaves or cling tightly to the branches or in some fork near the base of the plant, always in such position as not easily to be observed. They drop to the ground when disturbed, draw up their legs and 'play possum,' remaining motionless for some time and looking very much like a small lump of dry earth, the colour adding greatly to the resemblance. This habit of simulating death upon disturbance is common to many other insects of this family. They feed upon the leaves, but do more injury by severing them than by the amount of foliage consumed."

"The beetle seems to be purely American, and the genus *Aramigus* was in fact erected for it and another species (*A. tessellatus*), of about the same size, but of a silvery white colour, with faint green hue, which I have found in Kansas upon the well-known 'resin weed.' The beetle belongs to the same family, and is pretty closely allied to a well-known European beetle, *Otiorhynchus sulcatus* Fab., which is larger and darker in colour, and is also very injurious to greenhouse plants, as well as to some grown out of doors. This species also occurs in this country." The last-named beetle has been taken by Mr. Harrington at Sydney, Cape Breton, but has never yet been reported as an injurious insect in Canada.

Remedies.—Probably the most satisfactory remedies for this pest are those which are directed towards the destruction of the mature beetles. As stated above these are very retentive of life. They can, however, certainly be conquered by constant watchfulness and by keeping the plants in the house where they occur frequently sprayed all the time the perfect beetles occur with weak arsenical mixtures. Paris green of the strength of 1 lb. to 300 gallons of water is strong enough to destroy the beetles and will not injure the plants if kept well mixed all the time it is being used. Mr. Alderman Scrim, of Ottawa, an extensive grower of roses and other plants for winter cut-flowers was very successful in trapping the beetles by means of the small bamboo canes commonly used by florists for supporting potted plants in greenhouses. These were cut so that there



Fig. 28.

was an open joint about three inches in length at the top. Into this chamber so formed the beetles would crawl to hide during the day, and were easily and quickly crushed by pushing a small rod down the cane every morning without removing the cane. In this way Mr. Scrim destroyed large numbers at a time of the year when it was inconvenient to renew all the soil in his rose-houses. Prof. Riley quotes in his 1878 report from an account written by the late Mr. Peter Henderson, of New York, of the work of this beetle. After stating his belief that the failure of many to grow roses is due to the unknown presence of the larvæ at the roots, he says as follows: "Mr. John May, the gardener in charge of Mr. Slaughter's rose-growing establishment at Madison, New Jersey, which is probably the largest in the vicinity of New York, has given great attention to the rose bug, his roses for four or five years being much injured by it; but by persistent efforts in destroying the perfect insect, he has now got entirely clear of it."

Experiments to destroy the larvæ and pupæ in the ground by means of bisulphide of carbon were unsuccessful.

Prof. Riley having discovered the habits of the insect as to the deposition of its eggs suggested the value of placing traps, composed of rags, tape or paper tied round the stems of the plants or round short sticks placed close to the plants. In these the females would lay their eggs. The eggs take about a month to hatch, and by scalding the rags at short intervals all the eggs would be destroyed. If the plan of tying rags to sticks be adopted these can be dipped in scalding water and again replaced at once without untying the rags.

With this as with most of the other injurious insects the most important thing is for the florist to recognise the serious nature of the attack and the necessity of carrying on the war unceasingly until every appearance of the enemy ceases.

HYMENOPTERA PARASITICA.

BY W. HAGUE HARRINGTON, OTTAWA.

In his excellent work entitled a "Synopsis of the Families and Genera of the Hymenoptera of America, north of Mexico," Mr. E. T. Cresson gives the following concise statement of the general characters of the order Hymenoptera.

WINGS four, membranous, the posterior pair almost always smaller than the anterior, with comparatively few nervures.

MOUTH mandibulate, and with a lower lip or tongue, sheathed by the maxillæ.

TARSI generally 5-jointed, rarely 3 or 4-jointed, very rarely heteromerous.

ABDOMEN of the female furnished with a multivalve saw ovipositor, a borer, or a sting.

LARVA vermiciform and footless, except in the Phylophaga and Xylophaga.

PUPA incomplete and inactive.

Keeping these definitions in view it will be seldom difficult even for those who are not entomologists to decide whether a certain insect belongs to the Hymenoptera. Many flies (order Diptera) have a close superficial resemblance to species of Hymenoptera, but they may at once be distinguished on an examination of the wings, of which they invariably have only *two*.

Again insects may be found with four membranous transparent wings, as dragon flies (order Pseudoneuroptera) or cicadas (order Hemiptera), but in these orders the wings have a great number of nervures, or veins, forming a close network, and in all hemipterous species (bugs) the mouth is transformed into a proboscis, and lacks the mandibles or jaws common to Hymenoptera, and which are very apparent in large species like the bees.

We are informed that the abdomen of the female is furnished with a saw ovipositor, a borer, or a sting, and the order can be roughly divided into three sections based upon these differences in the sexual organs. The first section may be styled Phyllophaga (leaf-feeders), and contains the well-known saw flies, the larvae of which are caterpillar-like and possessed of feet. The second section includes the Xylophaga (wood-feeders), generally known as horntails, the larvae of which infest the trunks of trees, and the Parasitica (parasites) to which belong the long-stings and numerous allied forms. The third section Aculeata (sting-bearers) contains the bees, wasps, ants, etc.

Of the first and third sections as above indicated I have in former reports treated briefly, and I will now endeavor to outline the Parasitica, which constitute almost the entire second section, and which by reason of their great number and complexity of structure will make my task a difficult one to undertake in a single paper.

The section Parasitica contains at least half of the described species of our Hymenoptera, and the number of undescribed forms must be very large, as many of them are extremely minute and require more careful collecting and study than many entomologists can devote to them. They are divided into several families, of which some contain a large number of genera and species, and which will be briefly treated of in systematic order.

CYNIPIDÆ.—This family contains a moderate number of small species (often minute) and is divided into two sections, one containing three and the other two subfamilies. The species contained in the first section are in the larval state chiefly producers of galls, or dwellers therein, instead of being truly parasitic in their mode of life. There is reason to believe, however, that the few species which constitute the first subfamily (Ibaliinae) are true parasites upon the larvae of wood-boring insects. The principal Canadian species is *Ibalia maculipennis* Hald., which occurs somewhat rarely on maple and beech. The structure of the insect is such as to attract attention, for though of moderate size (hardly three-fourths of an inch in length) it is still the largest of our Cynipidæ, and is easily distinguished by its strongly compressed or knife-shaped abdomen. Within the abdomen, which constitutes merely a sheath for it, is coiled a delicate ovipositor, much longer than the insect itself, with which it deposits its eggs in the decaying trunks of the beech and maple, where the larvae when hatched probably exist upon other insects infesting the wood.

The subfamily Cynipinae contains species producing galls upon plants. The trees most subject to their attacks are the various species of oak; the galls occurring upon them and the insects produced therefrom being in themselves a sufficient study for an entomologist. Some of the galls, such as the oak-apple, are of enormous size as compared with the minute grub which occupies the central cell therein, and which by some mysterious influence upon the growth of the plant structure causes this wonderful abnormal development. The various species of roses are also very liable to the attack of these insects, the galls chiefly occurring being large potato-shaped ones upon the roots, oval woody enlargements of the stems and clusters of pea-shaped swellings upon the leaves. Although various plants, including the raspberry and blackberry, are subject to these attacks there is not space to enumerate them here.

The subfamily Inquilinæ as its title indicates contains species which are inquilines or guests in the galls of the preceding species, which in structure and appearance they closely resemble.

The truly parasitic species of the Cynipidæ are comparatively few in number.

EVANIIDÆ.—The species belonging to this family are easily distinguished, as the abdomen is attached to the disc or base of the metathorax, instead of to the apex as in the other families. The species found in Canada belong chiefly to the genus *Aulacus*, the members of which frequent decaying trees, in which they may be found ovipositing. We have also two species of *Foenus*—insects with a curious sickle-shaped abdomen—of which one (*F. incertus*) has a short ovipositor, while the other (*F. tarsatorius*) has a very long one. They may frequently be seen flying about trees, telegraph poles, etc., examining and entering insect burrows and crevices, and also upon golden-rod and other flowers in autumn. They are said to be parasitic upon certain bees. The species of *Evania*, which have curious hatched-shaped abdomens, are said to infest cockroaches.

TRIGONALIDÆ.—This family contains only one genus (*Trigonalyss*) and the four species therein are of rare occurrence and not as yet recorded from Canada. Habits unknown to me.

ICHNEUMONIDÆ.—This family is a very extensive one and contains our largest and best known parasites. It is divided into five sub-families of somewhat equal size. Of the sub-family Ichneumoninæ there are more than two hundred species

credited to the typical genus *Ichneumon*, and of these at least fifty occur in the vicinity of Ottawa. These ichneumons are somewhat wasp-like in form, but more slender; our largest species (*I. grandis*) is sometimes an inch in length, but some of the smaller species are less than one-third of an inch and the average size is about two-thirds. The ovipositor is short and retracted within the abdomen so as to be rarely visible, but the females may be distinguished by their stouter abdomens, and frequently by the antennæ being rolled, while those of the males are longer and straight. The anterior wings have a small pentagonal cell called an areolet, which occurs also in many other Hymenoptera, (see wing of *Cryptus*, Fig. 29) although the areolet is incomplete, triangular, rudimentary or wanting in many

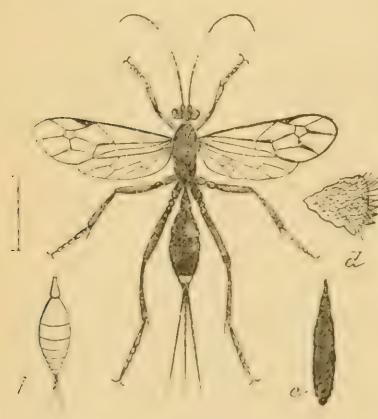


FIG. 29.

genera. Many of the ichneumons are entirely black (or with a few white markings,) others have the abdomen red, others again are banded with black and yellow, or are ferruginous with black markings. They are parasites of the caterpillars of our butterflies and moths. The genus *Amblyteles* contains a number of species almost identical in appearance with those of the preceding genus and of similar habits. *Hoplismenus* is distinguished by having pointed tubercles or spines upon the metathorax. A common and well marked species is *H. morulus*, which is a parasite of certain butterflies. The genus *Trogus* contains a few large species of which *T. exsorius*, a yellow species with smoky wings, is a common parasite of the caterpillars of our Black Swallow-tail butterfly, *Papilio asterias*.

CRYPTINÆ.—*Cryptus*, the typical genus of this sub-family, contains species

very similar in shape and colouring to those of the preceding sub-family, but of smaller size and having the ovipositor exserted and sometimes quite long. A common species is *Cryptus extrematis* which I have frequently bred from the cocoons of our large moth *Telea polyphemus*. Figure 29 shows the female and Figure 30 a cross-section of the moth's cocoon, indicating how the cocoons of the parasite lie side by side within it closely packed. The genus contains a great many species, as does also the genus *Phygadeuon*, the species of which differ chiefly in having the ovipositor shorter. The genus *Hemiteles* contains small species with incomplete areolet, which are said to be secondary parasites; i.e. parasites of parasites, while the species belonging to *Pezomachus* are wingless and ant-like in shape and may be found upon the ground or on foliage.

OPHIONINAE.—The species included in this sub-family usually have the ovipositor short, and they differ



FIG. 31.

from the rest of the Ichneumonidae in having the abdomen compressed laterally, so that it becomes sickle-shaped. Some of the larger forms show this in a marked degree. The typical genus *Ophion* contains large yellow insects of which some are very abundant. Our largest species is *Ophion macrurum* (Figure 31) which is a parasite of the caterpillar of the large American silkworm moth (*Telea polyphemus*). The larva of the ophion is a large, stout grub, which when full grown spins a dark brown cocoon which almost fills the cocoon of the moth, and from which the fly emerges by cutting a circular door at one end. *O. bilineatum* infests the White Miller moths, while *O. purgatum* (which has two yellow

specks in one of the cells of the anterior wing) is a parasite of the army worm.

Thyreodon morio is a fine insect of nearly the size and shape of *O. macrurum*, but of a deep black colour, with dark, smoky wings and yellow antennae. The genera *Exochilum* and *Heteropelma* contain a few large species of the same general appearance, while *Opheltes glaucopterus* might be mistaken for *Ophion macrurum*, except that there is an areolet in the anterior wing and that the terminal segments of the abdomen are black. This fine species has been bred by my friend Mr. Fletcher from the cocoons of *Cimbex Americana*, the great Willow Sawfly.* *Anomalon* and *Campoplex* contain a large number of species of moderate size, with the abdomen long and very thin. They are parasites of caterpillars, such as the destructive Tent caterpillars, and they do good service in keeping down such pests. Another large genus of very beneficial species is *Limneria*, but in this and the remaining genera of the sub-family the species are mostly small. Figure 32 shows *Thersilochus conotrachei* a parasite of the plum weevil. In *Banchus* the scutellum is often armed with a sharp spine.



FIG. 30.

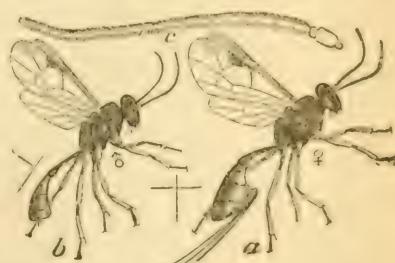


FIG. 32.

TRYPHONIN.E.—In this and the following sub-family the abdomen instead of being compressed laterally and thus being more or less knife-shaped, is cylindrical or flattened vertically, especially the basal segment, which instead of forming a slender petiole, is in the majority of genera attached to the thorax by its full width. In the present sub-family the ovipositor is short and not exserted. There are a number of genera, of which *Mesoleptus* and *Tryphon* are the most important, but without figures it would be difficult to satisfactorily describe any of the species. *Euceros* is distinguished by its flattened antennæ and *Chorinaeæ* by having one or two segments of the abdomen longitudinally keeled above, as in the genus *Rhogas* of the Braconidæ.

PIMPLIN.E.—This sub-family contains many fine species, including the largest and most striking of all our Hymenoptera. The structure of the abdomen is generally as in the preceding sub-family, but the exserted ovipositor is usually at least half the length of the abdomen, and not unfrequently is much longer than the whole body of the insect. This development of the ovipositor is due to the fact that the victims of those species in which it is very long are usually wood-borers, dwelling in burrows in the wood or under the bark of various trees and apparently secure from the attacks of the enemies of more exposed species. *Arotès* contains several handsome species; black, with markings of yellow or white, and with the ovipositor about the length of the insect. I have found them ovipositing in dead hickory, infested by *Saperda discoidea*, etc. Of *Rhyssa* there are five species recorded from Canada, of which *R. persuasoria* is also found in Europe. This is a large species, the female (with ovipositor) being $2\frac{1}{2}$ inches in length. The general colour is black, with white markings, but the legs are rufous. Provancher states that this species is an especial parasite of the large pine-borers, *Monohammus confusor* and *M. scutellatus*. I have not recognized the species at Ottawa yet, but have a male apparently belonging to it from Rev. G. W. Taylor, of Victoria, B.C. The closely allied genus *Thalessa* contains the giants of the Parasitica, those large species popularly known as "Long-stings." Two species, *atrata* and *lunator*, are common, while three others, which may be perhaps varieties, are recorded. The specific name of *Thalessa atrata* signifies that the species is black, and this is true of the female, with the exception of the head, the antennæ and portions of the legs. The male, however, has the legs almost entirely yellow, the thorax much varied with the same colour, and the abdomen much lighter than that of the female. A large female measures fully an inch and a half from the head to the tip of the abdomen, beyond which the ovipositor extends five inches. The legs, wings and antennæ are developed in proportion, so that the motions of the insect are active and she flies strongly. The size of these insects and their curious method of oviposition (egg-placing) have made them objects of much interest to entomologists. Their larvae are parasites (feeding externally) of the grubs of the wood boring "Horn tail" called *Tremex columba*. I am sorry that space does not permit me to give a fuller account of their habits, which have been very carefully worked out by Prof Riley. In *T. lunator*, which is a somewhat smaller species and more variable in size, the thorax and abdomen are largely marked with yellow. To those who wish to observe these insects I may say that they can generally be found about old maples and beeches in midsummer.

The genus *Ephialtes* contains several fine species having the abdomen tuberculate along the sides and the ovipositor as long as the insect itself. *E. irritator*, which I have taken on dead hickory in June has the abdomen and legs red, but other large species such as *gigas* and *occidentalis* are black, with the exception of the legs.

Pimpla, the genus from which the sub-family takes its name, contains a number of very useful species of which *P. conquisitor* (Figure 33) is a great aid in

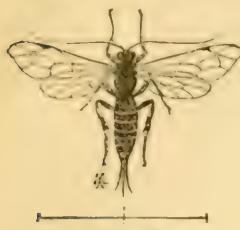


FIG. 33.

checking the ravages of the Forest Tent-caterpillar. I observed it to be very abundant in 1889. This species has the segments of the abdomen margined with white, but in our other species the thorax and abdomen are entirely black. The legs, however, as in this species, are usually

red, and more or less variegated with black and white. Our largest species, *P. pedalis*, also an enemy of *Clisiocampa*, has the legs red, with the exception of the hinder tibiae and tarsi, which are black, while *P. pterelas*, which can be bred in large numbers from pods of iris infested by the beetle *Mononychus vulpeculus*, has its legs entirely red. A very closely allied species *P. annulipes* (Figure 34) is said to be a parasite of *Carpocapsa pomonella*, the Codling moth, whose larvae do such enormous damage to our apples.

Differing from Pimplas chiefly in colour are two yellow species belonging to the genus Theronia. In Victoria, B.C., in May, 1888, I observed *T. fulvescens* to be very abundant and as it is a parasite of the western Tent-caterpillar, which was then in immense numbers, I have no doubt that the insects were then engaged in the good work of depositing their eggs in the obnoxious caterpillars. The species which occurs here is called *Theronia melanocephala* from its black head, and I have bred it from cocoons of *Halesidota maculata*.

The sub-family contains many other genera, some of which, as Xorides, Xylonomus, Eethrus and Odontomerus, include large handsome species.

STEPHANID.E.—This family only contains two genera, and the American species described are only four in number. They are rare in collections, and none are yet reported from Canada I think. In appearance they much resemble some species of the next family, and having long ovipositors are probably parasites of wood-borers.

BRACONID.E.—The described species of this family are not so numerous as those of the ichneumonids, nor are they so large, but they include many interesting forms, and many of great use in keeping down noxious insects. The braconids are distinguished from the ichneumonids by the venation of the anterior wings, which lack the cross-vein known as the second recurrent nervure. On examining the wing of *Cryptus*, for instance, (see Fig. 29) there is seen just below the areolet (or little pentagonal cell) a cross-vein, but if the wing of a Bracon (see Fig. 35) is examined it will readily be seen that there is no trace of a corresponding cross-vein. In the braconids also (except in one small section) the second and third segments of the abdomen are rigidly connected, instead of being flexibly jointed. They are separated into five divisions, which are further divided into sub-families.

CYCLOSTOMI.—In this division the clypeus (or portion of face just above the mouth) is emarginate, thus forming a semi-circular opening above the mandibles or jaws. There are nine sub-families, but the majority of the species are contained in the genera Bracon and Rhogas.



FIG. 34.

The larger species of Bracon are usually black, with bright red abdomen, dark, smoky wings, and a long ovipositor. They may be seen upon dead trees, and are largely parasitic upon the larvae of beetles which infest the trees. The larva of the Bracon spins a tough oval cocoon, perfectly flat above and below. Such cocoons can frequently be found under the bark of maple, cedar, etc., in the burrows of the beetles upon which the parasites preyed. The smaller species are reddish or yellowish, and infest dipterous and other larvae. Fig. 35 shows *Bracon charus* which is said to be a parasite of *Chrysobothris femorata*, the flat-headed apple tree-borer.

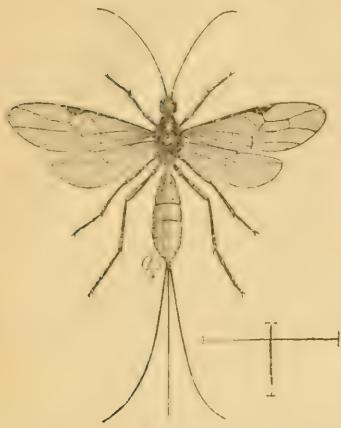


FIG. 35.

The species of Rhogas differ from Bracon in having the ovipositor short, the wings transparent, and especially in having the first segments of the abdomen carinate. *R. intermedius* is a medium sized yellow species which I have frequently bred from a handsome caterpillar (*Acronycta* sp.).

Many larvae live in one caterpillar, which dies from the attack when it is about full grown. The victims may frequently be seen extended on stems of grass, apparently at rest, but on closer examination are found to be stiff and hard, and perhaps riddled with minute holes from which a score or more of the flies have issued.

CRYPTOGASTRES.—The species included in this division are easily recognized by the form of the abdomen which, instead of consisting of several segments, with sutures (or joints) between them, seems to be in one piece. This shield-like abdomen, however, consists of the first three segments welded together. It conceals the ventral segments, and thus gives the name to the division, which contains the two sub-families, *Sigalphinae* and *Cheloninae*.

Fig. 36 shows very clearly the male and female of *Sigalus curculionis*, which is one of the parasites of the plum-cureulio.

AREOLARI.—In this division the distinguishing feature is in the venation of the wing, in which the second submarginal is minute, forming a small triangular areolet, or often imperfect. There are two subfamilies as in the preceding division. The first includes the well-known genera *Apanteles* and *Microgaster*; each containing many species, which, though small, are of great benefit in holding lepidopterous larvae in check. Mr. Howard (in Scudder's Butterflies of the United States and Canada) mentions no less than sixteen species of *Apanteles* as parasites of butterflies.

POLYMPORPHI.—This division contains several subfamilies, and includes some large species, such as *Helcon*, but it is almost impossible without illustrations to give any satisfactory idea of the numerous genera. Fig. 37 shows, greatly enlarged, *Macrocentrus delicatus*, a parasite of the Codling moth.

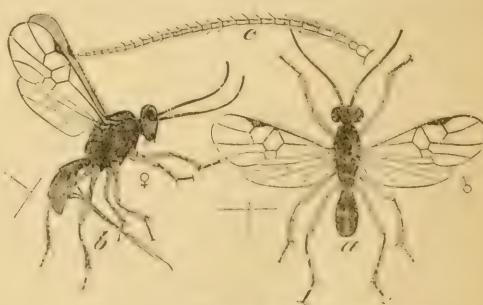


FIG. 36.

EXODONTES.—This division is very poorly represented in Canada, or at least in collections. The species are small, but may be distinguished by an examination of the mouth parts; the mandibles have the tips turned outward (as the name of division indicates), and cannot therefore be used for biting.

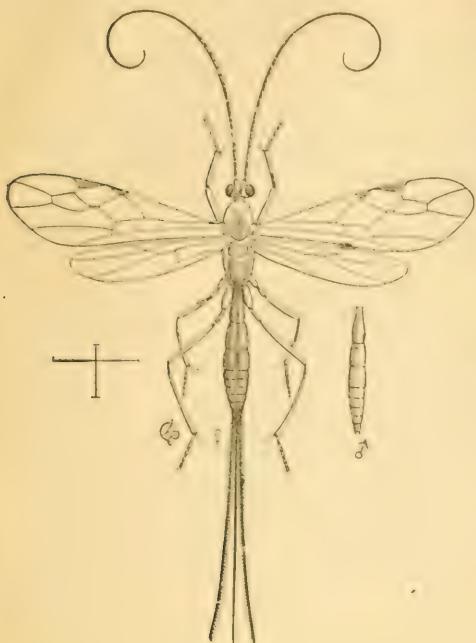


FIG. 37.

FLEXIVENTRES.—This division contains species which differ from all the other braconids in having the segments of the abdomen freely articulated, so that it can be bent under the thorax. There is only one sub-family, the Aphidiinæ, and the species are very small, yet they are of great economic importance, as they are parasites of various species of aphides, or plant-lice. The larva feeds inside the aphis, which becomes swollen, and finally is found fixed to the plant on which it has been feeding, a mere dead shell from which the tiny parasitic fly has escaped. The grain aphis is said to be kept in check by one species, which alone must save an immense sum to our farmers.

CHALCIDIDÆ.—Here we have another very extensive family; the species

differing greatly in structure and in habits. They are always small, but frequently are very brilliant in appearance, glittering with bright tints and metallic lustres. It will only be possible to glance at a few of the forms, as the great diversity of structure which obtains among them, and their minuteness make their study and identification difficult except for one who can devote much time to it. The wings have scarcely any traces of venation, except the vein along the front edge.

Leucospis affinis is our largest species; a black and yellow fly about one-fourth of an inch long, with its ovipositor curved up over the abdomen in a curious manner. It is frequently found on golden-rod, and is a parasite of bees.

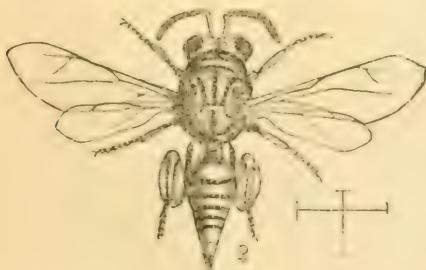


FIG. 38.



FIG. 39.

Smiera and *Chalcis* contain species remarkable for the development of the hind legs. Fig. 38 shows *Smiera maria*, which is a parasite of the *Cecropia* caterpillar, and Fig. 39 gives *Chalcis flavigipes* which attacks the larva of the cotton moth.

The genus *Torymus* contains a number of species, which may be bred from different galls. The females have the abdomen flattened ovate, and sometimes prolonged to an acute point; the abdomen of the males is very small, and the insects are black. A not uncommon species is *T. gigantea*, which is bred from the large globular galls produced on stems of golden-rod by a fly (*Trypetia solidaginis*), about the size of a house fly, with mottled wings.

The closely allied genus *Isosoma* contains species which depart from the parasitic habits of the majority of the family, and become themselves noxious insects.

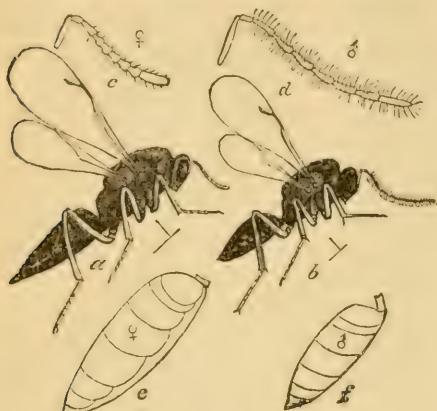


FIG. 40.

Infested chrysalid can be found. The species of *Tetrastichus* are also frequently parasites of butterflies, while *T. esurus* (Fig. 42) has been bred from the cotton moth. The genus *Trichogramma* (which constitutes a sub-family) also has similar habits, and *T. minutum* (Fig. 41) is a parasite of our large Milkweed Butterfly (*Danaus archippus*).

PROCTOTRUPIDÆ.—This family has been but meagrely investigated in Canada, although the species are numerous, and often of interesting structure. They are not so varied in coloring as the Chalcididae, to which they are closely related, but are usually brown or black. Many of them are wingless, living among low herbage and moss, and some of the genera consist of species so minute that they live and mature in the eggs of other insects. I have found clusters of moths' eggs from each of which, instead of a young caterpillar, has issued a perfect winged fly (*Teleas orgyia*.) Those of *Scelio* infest, I believe, the eggs of grasshoppers or crickets.

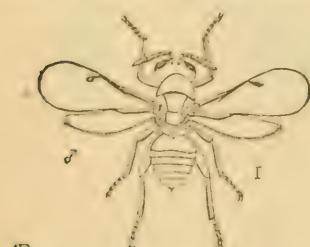


FIG. 42.

her head and thorax—her total length is about two inches. The females are

Isosoma hordei (Fig. 40) is the well-known Joint-worm of wheat and barley straw, making gall-like swellings at the joints, in which several cells may be found, each containing a little grub.

The sub-family *Pteromalinae* contains, amid a great complex of tribes and genera, a correspondingly great number of species. The typical genus, *Pteromalus*, alone contains more than 30 species, of which some are well-known parasites of butterflies. *P. puparum* is recorded as bred from eleven species of butterfly, and is a common destroyer of the chrysalids of the cabbage white butterfly (*Pieris rapae*) and of *Vanessa antiopa*. I have counted more than 450 flies from one pupa of the latter, and sometimes scarcely an unin-

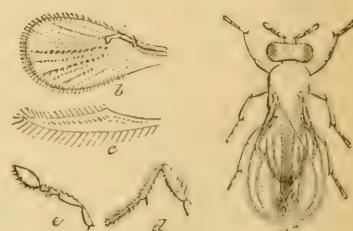


FIG. 41.

fested chrysalid can be found. The species of *Tetrastichus* are also frequently parasites of butterflies, while *T. esurus* (Fig. 42) has been bred from the cotton moth. The genus *Trichogramma* (which constitutes a sub-family) also has similar habits, and *T. minutum* (Fig. 41) is a parasite of our large Milkweed Butterfly (*Danaus archippus*).

PELECIINIDÆ.—This family is a very easy one to study, as it contains only one species, *Pelecinus polyturator*, the shape of which is so different from all other hymenoptera that it can be quickly recognized. This fine insect is of a glossy black, with short wings, containing few veins. The male has a club-shaped abdomen, but the female has hers greatly elongated—about five times the length of

not uncommon, and generally fly near the ground, but their habits are otherwise unknown. I have taken them as far eastward as Nova Scotia, but I do not know how far westward their range extends. The male is exceedingly rare, and I have only seen one specimen that was captured in Ontario.

Although this review of the great complex of insects embraced in the Parasitica has been a very rapid and incomplete one, I hope that it has at least given some idea of their great number, their diversity of structure and their economic importance. We see that egg, larva and pupa are alike subject to their attacks, and that scarcely any form of insect defence appears to be sufficient to prevent their attacks. The grub gnawing his hidden burrow in the tree, and the scale insect adhering firmly to the twig, alike have their parasitic foes differing in size and method of attack.

It will be observed further that the value of any species in destroying obnoxious forms does not depend upon its size or strength. The greatest benefits are often effected by atoms so minute as almost to escape our search, but which by their numbers work wholesale destruction to their victims. The tiny fly that destroys a cluster of eggs is a greater helper than the larger one that might later destroy the brood of caterpillars, because in the latter case a certain amount of depredation is committed before the labours of the parasite are fulfilled. The diminutive devourers of aphides are of unknown value, as plant-lice increase so enormously by rapidly succeeding generations that if it were not for such providential safeguards they would swarm everywhere working devastation.

INSECTS INJURIOUS TO THE ELM.

BY F. B. CAULFIELD, MONTREAL.

First are insects injurious to the trunk.

1. THE COMMON ELM-TREE BORER, *Saperda tridentata*, Oliv, Order Coleoptera, Family Cerambycidae.—A very destructive insect, boring in the inner bark and the surface of the wood of elm trees. Fitch states that the eggs are deposited in June and that the young larvæ nearly complete their growth before winter, and soon after warm weather arrives in spring they pass into the pupa state. Packard, who has found the larva in abundance in spring in Providence, under the bark of old dead elms, describes it as follows:—“ White, sub-cylindrical, a little flattened, with the lateral fold of the body rather prominent; end of the body flattened, obtuse, and nearly as wide at the end as at the first abdominal ring. The head is one-half as wide as the first prothoracic ring, being rather large. The prothoracic segment, or that next to the head, is transversely oblong, being about twice as broad as long; there is a pale dorsal corneous transversely oblong shield, being about two-thirds as long as wide, and nearly as long as the four succeeding segments; this is smooth, except on the posterior half, which is rough, with the front edge irregular and not extending far down the sides. Fine hairs arise from the front edge and sides of the plate, and similar hairs are scattered over the body and especially around the end. On the upper side of each segment is a transversely oblong ovate roughened area, with the front edge slightly convex, and behind slightly arcuate. On the under side of each segment are similar rough horny plates, but arcuate in front, with the hinder edge straight.”

It differs from the larva of *Saperda vestita*, Say, in the shorter body, which is broader, more hairy, with the tip of the abdomen flatter and more hairy. The prothoracic segment is broader and flatter, and the rough portion of the dorsal plates is larger and less transversely ovate."

These destructive grubs by tunnelling and undermining, loosen large portions of the bark, stopping the flow of sap, weakening and finally killing the tree.

The perfect insect is a flat-bodied beetle, measuring from four to six-tenths of an inch in length. It is of a rather dark brown colour above, with a grayish tinge caused by a coat of very short downy hairs. The under surface blueish gray. The basal joints of the antennae are blackish brown, the remainder paler. A line of orange encircles each eye, and a stripe of the same colour runs from the antennae to the hind margin of the thorax, and is continued along the edge of the wing-covers where they are bent down over the sides of the body, getting narrower gradually until it reaches the tip. From this border, three branches or teeth run obliquely towards the inner edge of the wing-covers, the middle one being the longest. There are six small black spots on the thorax, two on top just behind the antennae, and two on each side below the orange stripe, and at each angle of the stripes on the wing-covers, there is a small dark patch or spot.

Any trees known to be attacked by borers should be cut down in the fall or during the winter, and used for firewood, care being taken not to leave any exposed during the summer; particularly in June and July, as at this time most of our borers deposit their eggs. It follows, therefore, that no freshly cut, or fallen trees, or branches should be left lying about, and if cordwood is piled, it should be covered, as the borers will surely find all newly felled wood if left exposed, and where such carelessness is permitted, will congregate and multiply year after year.

2. THE LATERAL ELM BORER, *Saperda lateralis*, Fab, Order Coleoptera, Family Cerambycidae.—This beetle very closely resembles the preceding species, and its habits appear to be the same; it differs somewhat in markings, as the orange border on the wing-covers wants the three teeth running towards the inner margin. It bores in the inner bark of the elm, appearing in June, but seems to be less common than *Saperda tridentata*.

3. THE SIX-BANDED DRYOBIUS, *Dryobius sexfasciatus*, Say, Order Coleoptera, Family Cerambycidae.—According to Dr. Fitch, the larva of this species is similar to that of *Saperda tridentata*, and is found along with it; it is, however, larger than that species.

The perfect insect is a black beetle measuring from three-fourths to seven-eighths of an inch in length. The general colour is black, the thorax deeply margined with yellow, and each wing-cover is ornamented with four oblique bands of the same colour; the scutell, as entomologists name the little triangular piece at the base of the wing-covers, is also yellow. The antennae are reddish brown, the legs reddish, the thighs being dilated or swollen, the abdomen is banded with yellow. I do not find this species on the Society's list of Canadian beetles, but think I have seen it recorded by a Canadian entomologist.

4. THE SHORT-LINED DULARIUS, *Dularius brevilinens*, Say, Order Coleoptera, Family Cerambycidae.—This is a large black longicorn beetle, with dark blue wing-covers, not covering the whole of the abdomen; a rounded thorax, flattened above and the thighs very much swollen. The antennae are about two-thirds the length of the body, flattened towards the end, and somewhat serrate. The body above is velvety black, and brown black beneath. The head is black and coarsely punctured, and the prothorax is covered with short, dense, black hairs, like velvet. The wing-covers are Prussian blue in colour, bent, corrugated, with an interrupted ridge just outside the middle of each cover. They are covered with fine black

hairs, bent over. There is a pair of parallel short honey-yellow lines in the middle of each wing-cover, with a third one a little in front, making in all six streaks. The legs and feet are black. It is a little over eight-tenths of an inch in length." (Packard).

Bores in elm trees. Mr. George Hunt has observed this species inserting its eggs in the crevices of the bark. Occurs in Ontario and Quebec, but apparently is not abundant.

5. THE RED-HEADED CLYTUS, *Neoclytus erythrocephalus* Fab, Order Coleoptera, Family Cerambycidae.—This pretty little beetle bores in the elm and also in hickory, etc. "It is about one-third of an inch long, and hardly one-tenth of an inch wide, the thorax being very cylindrical and as wide as the wing-covers. The colour is a rusty red, the head being of a lighter red, whence the name *erythrocephalus*, from two Greek words signifying "red-head." The antennæ are about one-half as long as the body; the elytra have four narrow yellow bands across them, and the legs are long and slender, especially the hinder pair, which are almost twice as long as the body. This beetle is exceedingly quick in its movements, and is difficult to capture as it runs swiftly, and take to flight instantly, if disturbed." (Harrington). This species has been taken on hickory by Mr. W. H. Harrington and has been bred from that tree by Drs. Leconte and Horn. It has been found under the bark of an old sugar maple by Mr. G. Hunt, and bred from oak by Dr. Riley. It has been found boring in dead elms in Michigan by Hubbard, and I have myself found it at Montreal on a fallen red oak, so that it appears to infest various kinds of forest trees.

At least two species of bark-beetles are known to infest the elm. The *Scolytidae*, to which family they belong, are all of very small size. The female drives a long gallery between the bark and the wood, depositing an egg at intervals as she progresses; each larva when hatched drives a tunnel at almost a right angle to the main gallery, and when its transformations are completed, cuts a hole through the bark, through which it escapes. A tree infested by these insects, looks as if it had been riddled with shot, and the surface of the wood is scored in all directions with their burrows, loosening the bark and destroying the tree.

6. THE ELM BARK-BORER, *Phloeotribus liminarius*, Harris, Order Coleoptera, Family Scolytidae.—According to Dr. Harris this little beetle "is of a dark-brown colour; the thorax is punctured, and the wing-covers are marked with deeply punctured furrows, and beset with short hairs. It does not average one-tenth of an inch in length."

7. THE BLACK ELM BARK-BORER, *Hylesinus opaculus*, Leconte, Order Coleoptera, Family Scolytidae.—This is a stoutly built pitchy-black beetle found under the dry bark of elm and ash trees. Both these species are given in the Society's list of Canadian beetles.

8. According to Packard, THE SNOWY TREE CRICKET, *Oecanthus niveus*, Serville, deposits its eggs in the corky bark of the elm in the Southern States. The perfect insect, Fig. 43, is a slightly formed pale green cricket, with ivory white wings; the female, Fig. 44, with a long ovipositor. Very common in Ontario and Quebec, as far east as Montreal.

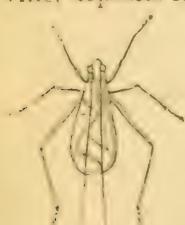


Fig. 43.

Second are insects injuring the leaves.

9. THE ANTIOPA BUTTERFLY, *Vanessa antiopa*, Linne, Order Lepidoptera, Family Nymphalidae.—Every one who has walked through the woods in early spring, must have noticed a large dark-colored butterfly, that dashing up when approached, after circling



Fig. 44.

around for a few moments, now fluttering, and anon gliding on motionless wing, settles down again in some sheltered spot where it sits opening and closing its wings, enjoying the balmy air and bright sunshine that once again awakens nature from her death-like sleep, to renewed life and activity. This is the well-known *Antiopa* butterfly, the "Camberwell Beauty" of the English entomologists. *Antiopa* passes the winter in any convenient shelter that it can find. Dr. Harris tells us that he has found it sticking to the rafters of a barn, and in the crevices of walls and stone heaps, huddling together in great numbers. It also hibernates on the ground, clinging to the under surface of stones in dry situations. The female deposits her eggs in a cluster around a twig of elm, willow or poplar; and until nearly full grown, the caterpillars keep together. The mature larva is black, thickly dotted with white giving it a grayish appearance. On top of the back is a row of eight brick-red spots, and the body is armed with a number of strong branching spines. The first brood of caterpillars appears in June, the second in August, and the butterflies from the last brood hibernate. The butterfly is dark maroon brown on the upper side of the wings, with a broad border of yellow, thickly dotted with brown; on the inner side of this border there is a band of black, in which is set a row of blue spots; the front edge of the wings is marked with fine yellow lines and two spots of the same colour. A variety is occasionally met with, in which the yellow border is unusually broad, and the dark band with the blue spots is wanting.

If numerous enough to be troublesome, these caterpillars may be killed by shaking them off the branch on which they are congregated, and crushing them. This should be done while they are small, as when nearly full grown, they scatter over the trees and wander about in search of a suitable place in which to undergo their transformations.

10. THE INTERROGATION BUTTERFLY, *Graptia interrogationis*, Fah, Order Lepidoptera, Family Nymphalidae.—This is a dimorphic species, the hibernating form being known as *Fabricii*, the other as *Umbrosa*. Fig. 45 represents *G. progne*, a closely allied species.



Fig. 45.

Farther to the south there are about four broods in a season, but with us only two, and while the last brood gives the pale form which hibernates, the other broods are more or less mixed. *Fabricii* has the upper surface fulvous, spotted with black and clouded with warm brown; on the hind wings the brown predominates, the lighter colour being restricted to a patch on the upper angle, and a row of spots a little inside the outer edge; the edges

of all the wings are light purplish blue. The front margin of the fore wings is convex, the tip cut squarely off, the outer margin concave. Hind wings tailed. Under surface marbled and clouded with various shades of brown and purple, and with an interrupted C. in the middle. *Umbrosa* has the upper surface of the hind wings almost entirely black, the submarginal row of spots being absent, the fore wings are not so falcate, and the tail on the hind wings is shorter.

"The young larvae are whitish yellow, somewhat marked with brown, head black. After the first moult their colour is black, more or less speckled with white, and they begin to be clothed with short spines, all black except those on the eighth and tenth segments which are whitish. After the second moult they begin to assume the type they retain to maturity. The spines are in seven rows, fleshy at base, slender and many-branching at extremity; the dorsal and first

lateral on joint 3 are black, on joints 2, 4, and 11 russet, the rest yellow; the second laterals black throughout, the lowest row greenish, head bilobed, black, with short black spines on vertices. After the third moult the larvae vary greatly both in colour of body and spines. Some are black, finely specked with yellowish; others are yellow-brown, specked with yellow tubercles; others gray-brown with indistinct reddish lines between the spines on the dorsal and two lateral rows, and much tuberculated; others are black with fulvous stripes and profusely covered with yellowish tuberculated spots and points. The spines vary from black to fulvous and green and yellow. (French). Feeds on elm, basswood, hop, nettle and false nettle.

Trupta comma, Harris, closely resembles the preceding species but is smaller, and the wings are not so decidedly falcate. Food plants the same.

11. THE SPRING CANKER WORM, *Anisopteryx vernata*, Peck, Order Lepidoptera, Family Phalaenidae.—Late in autumn when the leaves have fallen and the insect tribes have almost entirely disappeared, this fragile looking moth, Fig. 46,



Fig. 46.

may be seen flying slowly through the deserted woods. "The fore wings of the male are ash-coloured and semitransparent, with a broken whitish band crossing the wings near the outer margin, and three interrupted brownish lines between that and the base. There is an oblique black dash near the tip of the fore wings and a nearly continuous black line before the fringe. The hind wings are plain, pale ash-coloured, or very light gray, with a dusky dot about the middle of each." (Saunders.)

A second species, *A. pometaria*, Fig. 47, very closely resembles *vernata*, but the wings are less transparent and are a little darker in colour, and the hind wings are generally crossed by a white band. The females of both species are wingless. The eggs are deposited in masses, generally in crevices in the bark. The larvae vary in colour from greenish yellow to gray and dark brown. When fully grown they leave the trees by creeping down or else lower themselves by means of a silken thread and enter the ground to change to chrysalis. The moths generally emerge late in the fall, but some individuals do not appear until spring. To prevent the females creeping up the trees, strips of canvass or stiff paper, covered with tar or printers' ink, should be applied to the tree, renewing the covering from time to time to keep it soft and sticky, and as the moths may deposit their eggs below the band care must be taken to leave no crevices through which the young caterpillars might pass.

Canker worms are widely distributed, occurring in Canada as far east as Montreal at least. They feed on many kinds of leaves, and where precautionary measures are not adopted often prove exceedingly injurious.

12. THE NOVEMBER MOTH, *Epirrita dilutata*, Hb., Order Lepidoptera, family Phalaenidae.—This moth, like the Canker worm, flies late in autumn and would be easily mistaken for that insect. The body and wings are pale ash gray, the fore wings with eight wavy black lines and double row of black dots next the margin. Fringe whitish. Hind wings with four faint wavy lines. Wings expand about an inch and a quarter. Although generally not common in this neighbourhood, it is occasionally quite abundant.



Fig. 47.

The following insects are also known to feed on the elm :

Coleoptera.—*Galeruca calmariensis*, Linn ; *Chrysomela scalaris*, Leconte ; *Monocesta caryli*, Say ; *Graptodera chalybea*, Ill ; *Cotalpa lanigera*, Linn ; *Magdalisa armicollis*, Say.

Hymenoptera.—*Tremex columba*, Linn ; *Cimbex Americana*, Leach.

Hemiptera.—*Colopha ulmicola*, Fitch ; *Eriosoma Rileyi*, Thomas ; *Schizoneura Americana*, Riley ; *Callipterus ulmicola*, Thomas.

Lepidoptera.—*Papilio turnus*, Linn ; *Ceratomia quadricornis*, Harris ; *Hyphantria textor*, Harris ; *Telea polyphemus*, Hubn ; *Hyperchiria io*, Fabr ; *Halysidota caryae*, Harris ; *Orgyia nova*, Fitch ; *Orgyia leuco-tigma*, Alib and Smith ; *Datana ministra*, Drury ; *Tolytela velleda*, Stoll ; *Edema albifrons*, Walk ; *Clisiocampa Americana*, Harris ; *Clisiocampa sylvatica*, Harris ; *Apatela vinnula*, Grote ; *Apatela occidentalis*, Grote ; *Apatela morula*, Guen ; *Apatela ulmi*, Harris ; *Paraphia unipunctaria*, Haw ; *Metanema quercivora*, Guen ; *Hibernia tiliaria*, Harris ; *Sicya mucularia*, Guen ; *Metrocampa perlaria*, Guen ; *Eugenia subsignaria*, Hubn ; *Nephopteryx undulatella*, Clem ; *Nephopteryx ? ulmi-axrosorella*, Clem ; *Bactra ? argutana*, Clem ; *Lithocolletis argentinotella*, Clem ; *Lithocolletis ulmella*, Clem ; *Argyresthia austerella*, Zeller.

Mr. A. F. Winn informs me that *Pyrameis atalanta*, Linn, feeds readily on elm in confinement and that he has seen *Graptu j-album* ovipositing on it.

THE ENTOMOLOGY OF SHAKESPEARE.

BY THE REV. THOMAS W. FYLES, SOUTH QUEBEC.

Some time ago, in a list of books upon Shakespeare and his works, I noticed that there was one upon the *Entomology of Shakespeare*. The book was beyond my reach. It occurred to me that it would be an interesting study to examine for myself and find out what particulars the great moralist and prince of poets had gathered concerning insects from the folk-lore of his day and his own observation, and to what account in his plays he had turned the knowledge he had gained. Accordingly, as leisure was afforded me, I read over the plays carefully and noted down the allusions to insects that I discovered. I found that the plays contained at least 168 references to insects, viz.:—To honey-bees, 18 ; humble-bees, 5 ; wasps, 8 ; ants, 3 ; stinging-insect undesignated, 1 ; butterflies, 6 ; moths and their larvæ, 24 ; beetles and their larvæ, 11 ; gnats, 10 ; fleas, 6 ; brize-flies, 2 ; bots, 1 ; blow-flies, 16 ; flies, 22 ; sheep-tick, 1 ; louse, 8 ; cricket, 4 ; locust, 1 ; grasshopper, 1 ; spiders, 17 ; scorpions, 3. Grouped according to orders these would give : Hymenoptera, 35 ; Lepidoptera, 30 ; Diptera, 58 ; Coleoptera, 11 ; Hemiptera, 7 ; Orthoptera, 6 ; Arachnida, 20. The references which I discovered are thus distributed : The highest numbers are in *Troilus and Cressida*, 11 notices referring to 9 species ; *Romeo and Juliet*, 11 notices referring to 8 species ; and 2nd Part of *K. Henry VI.*, 10 notices referring to 6 species. *Midsummer Night's Dream*, *K. Henry V.*, *Cymbeline*, and *King Lear* have 8 notices each ; 1st Part of *K. Henry IV.* and *Hamlet* have 7 each ; *The Tempest*, 2nd Part of *K. Henry IV.*, *Coriolanus*, *Antony and Cleopatra*, *Titus Andronicus* and *Othello* have each 6 notices ; *The Winter's Tale* has 5 ; *The Merchant of Venice*, *Taming of the Shrew* ; 3rd Part of *K. Henry VI.*, and *Pericles Prince of Tyre* have 4 each ; *The Two Gentlemen of Verona*, *Love's Labour's Lost*, *King John* and 1st Part of *K. Henry VI.* have 3 each ; *Merry Wives of Windsor*, *Comedy of Errors*, *Macbeth*, *King Richard II.* and *Julius Caesar* have 2 each ; *Measure for Measure*, *As you like it*, *All's well that ends well*, *King Richard III.*, *King Henry VIII.* and *Timon of Athens* have each a solitary reference ; and in *Much ado about nothing* I could find none. The number of species mentioned is over 30. We will take them according to orders.

HYMENOPTERA.—Shakespeare's ideas of the honey-bee seem to have been somewhat confused. He was misled probably by the old-world learning newly revived in his day: and, in his allusions to the "magnanimous leaders, the manners and employments, the tribes and battles of the race," he seems to have followed in the footsteps of Virgil (Georgics, Book IV.), or of writers who were acquainted with Virgil. His Archbishop of Canterbury in King Henry V. speaks of the head of the hive as a "King." The passage in which this occurs is very fine; and I am tempted to give it in its entirety.

—So work the honey-bees;
 Creatures, that, by a rule in nature, teach
 The act of order to a peopled kingdom.
 They have a king, and officers of sorts:
 Where some, like magistrates, correct at home:
 Others, like merchants, venture trade abroad;
 Others, like soldiers, arm'd in their stings
 Make boot upon the summer's velvet buds;
 Which pillage they with merry march bring home
 To the tent-royal of their emperor:
 Who, busied in his majesty, surveys
 The singing masons building roofs of gold;
 The civil citizens kneading up the honey;
 The poor mechanic porters crowding in
 Their heavy burdens at his narrow gate;
 The sad ey'd justice, with his surly hum,
 Delivering o'er to executor's pale
 The lazy yawning drone.

Act I. sc. 1.

It would seem too that the strange story told by Virgil—how Aristaeus, son of Cyrene, sacrificed cattle and left the carcases exposed till, "wondrous to relate, bees through all the belly hum amidst the putrid bowels of the cattle, pour forth with fermenting juices from the burst sides, and in immense clouds roll along, then swarm together on a top of a tree and hang down from the bending boughs" (Georgics, Bk. IV.)—had left an impression upon his mind, for he puts in the mouth of King Henry IV., who is lamenting the behaviour of Prince Henry of Monmouth, the words:

"Tis seldom when the bee doth leave the comb
 In the dead carion.

Act IV., sc. 4.

His observations of the bees however were, in many points, correct. He noticed that they "gather'd honey from the weed" (Henry V., Act IV., sc. 1); that they took "toll from every flower" (2nd Part K. Henry IV., Act IV., sc. 4); that "drones" rob the hives (Pericles, Prince of Tyre, Act II., sc. 1; Merchant of Venice, Act II., sc. 5; 2nd Part K. Henry VI., Act IV., sc. 1); that the wasps steal the honey and kills the bees (Two Gent. of Verona, Act I., sc. 2, and Titus Andronicus, Act II., sc. 3); that the swarm deprived of its leader becomes vindictive:

The commons like an angry hive of bees
 That want their leader, scatter up and down
 And care not who they sting in his revenge.

2nd Part K. Henry VI., Act III., sc. 2.

With the methods pursued by the bee-masters of his day he was acquainted. Bolingbroke says:

—like the bee tolling from every flower the virtuous sweets,
 Our thighs pack'd with wax, our mouths with honey
 We bring it to the hive; and like the bees
 Are murder'd for our pains.

2nd Part K. Henry IV., Act IV., sc. 4.

And Talbot in 1st Part of K. Henry VI., Act I., sc. 5:

So bees with smoke and doves with noisome stench
 Are from their hives and houses driven away.

The "Red-hipped humble-bee" of Shakespeare is *Bombus lapidarius*. This

species makes its nest very commonly under stone-piles by the road-side. It is a handsome and courageous insect; and Nick Bottom the Weaver gave the fairy Cobweb no light task when he bade him :

Monsieur Cobweb: good monsieur, get your weapons in your hand; and kill me a red-hipped humble-bee on the top of a thistle; and good monsieur, bring me the honey-bag.

Midsummer Night's Dream, Act IV., sc. 1.

It is to be hoped that Oberon interposed in behalf of the bee, for

Full merrily the humble-bee doth sing
Till he hath lost his honey and his sting;
And being once subdued in armed tail
Sweet honey and sweet notes together fail.

Ibid, Act V., sc. 2.

Other passages in which bees are mentioned are The Tempest, Act I., sc. 2, and Act V., sc. 1; Midsummer Night's Dream, Act III., sc. 1, Love's labour's lost, Act III., sc. 1; All's well that ends well, Act IV., sc. 5; Comedy of Errors, Act II., sc. 1; 2nd Part K. Henry VI., Act IV., sc. 2; Troilus and Cressida, Act I., sc. 3, Act II., sc. 2, and Act V., sc. 2; Cymbeline, Act III., sc. 2; and Titus Andronicus, Act IV., sc. 1.

Shakespeare's allusions to the Wasp (*Vespa vulgaris*) convey the ideas of :

(1) *Petulance*—Tempest, Act V., sc. 1:

Mar's hot minion is returned again
Her waspish-headed son has broke his arrows.

See also Winter's Tale, Act I., sc. 2; 1st Part K. Henry IV., Act I., sc. 3; and Julius Cæsar, Act IV., sc. 3.

(2) *Injustice*—Two Gentlemen of Verona, Act I., sc. 2:

O hateful hands to tear such loving words
Injurious wasps! to feed on such sweet honey,
And kill the bees that yield it, with your stings.

(3) *Vengeance*—Titus Andronicus, Act II., sc. 3:

—When you have the honey you desire
Let not this wasp outlive, us both to sting.

In the 3rd Part of K. Henry VI., Act II., sc. 6, it is said of the defeated Lancastrians :

For though they cannot greatly sting to hurt,
Yet look to have them buzz to offend thine ears.

The commonest species of English ants is *Formica rufa*. This probably is the species mentioned in 1st Part of K. Henry IV., Act I., sc. 3 by Hotspur :

Why, look you, I am whipp'd and scourg'd with rods,
Nettled and stung with pismires.

Among the "skimble-skamble stuff" that angered Hotspur was Glendower's talk of "the moldwarp and the ant" (Ib. Act III., sc. 1). The ant also is mentioned in King Lear, Act II., sc. 4.

LEPIDOPTERA.—To butterflies there are but few references in Shakespeare, but the few shew that the great dramatist had closely observed these beautiful objects. He knew of their metamorphoses, and says :

—There is a difference between a grub and a butterfly, yet your butterfly was but a grub.
Coriolanus, Act V., sc. 5.

In his choice of an adjective to describe their wings he could not have found a more appropriate word than he has in

—Men like butterflies
Shew not their mealy wings, but to the summer.
Troilus and Cressida, Act III., sc. 3.

There is a charming suggestion of the shape of the butterfly's wings in Mid-summer Night's Dream, Act II., sc. 1, where Titania bids the fairies :

—Pluck the wings from painted butterflies
To fan the moon-beams from the sleeping eyes.

(of the strange being with whom she is enamoured).

An adjective that Shakespeare applies on two occasions to the butterfly is "gilded" :

And laugh at gilded butterflies.

King Lear, Act V., sc. 2.

I saw him run after a gilded butterfly.

Coriolanus, Act I., sc. 3.

What particular species he is alluding to in these passages we cannot tell—probably to one of the Fritillaries and possibly to the "High Brown" (*Argynnis adippe*). In connection with this insect Morris writes:—"It has been well observed that all the best and highest enjoyments of man are those which, coming as they do direct from the bounteous hand of the Omnipotent himself, are not purchasable with money or any other human commodity. Every aspect under which nature is viewed throws light upon this remark and gilds it with the unmistakable lustre of truth." The under side of the hind-wings of *Adippe* are gorgeous with their large silver spangles and their rusty red spots. The combination of these as the insect flutters by certainly gives the idea of gilding. Other adjectives used by Shakespeare in relation to butterflies are "painted" (as above), and "summer" (Coriolanus, Act IV., sc. 6), both appropriate enough.

To moths and their laryæ we find many allusions. The canker-worm especially afforded the poet many apt and beautiful comparisons. Several of these refer to love. Who is not familiar with the words of Viola in Twelfth Night telling of the effect of unrequited love upon health :

—She never told her love
But let concealment, like a worm i' the bud
Feed on her damask cheek.

Act II., sc. 4.

There is wisdom quaintly expressed in the advice given by the suspicious Laertes to his sister :

The chariest maid is prodigal enough,
If she unmask her beauty to the moon :
Virtue itself 'scapes not calumnious strokes :
The canker galls the infants of the spring,
Too oft before their buttons be disclosed ;
And in the morn and liquid dew of youth
Contagious blastments are most imminent.

Hamlet, Act I., sc. 3.

In the Two Gentlemen of Verona we have a playful conversation upon the effect of love upon the understanding :

Valentine.—Love is your master, for he masters you :
And he that is so yoked by a fool,
Methinks should not be chronicled for wise.

Proteus.—Yet writers say, As in the sweetest bud
The eating canker dwells, so eating love
Inhabits in the finest wits of all.

Valentine.—And writers say, As the most forward bud
Is eaten by the canker ere it blow,
Even so by love the young and tender wit
Is turn'd to folly ; blasting in the bud,
Losing his verdure even in the prime,
And all the fair effects of future hopes.

In another passage beautiful and pathetic "grief" is the canker. The unhappy Constance speaks of her little son Arthur, who is in the toils of his wicked uncle John :

But now will canker sorrow eat my bud
And chase the native beauty from his cheek.

King John, Act III., sc. 4.

In the 2nd Part of K. Henry VI. (Act I., sc. 2) the canker is "ambition." The Duke of Gloster, replying to his wife, says :

O Nell, sweet Nell, if thou dost love thy lord,
Banish the canker of ambitious thoughts.

In another part of the same play (Act III., sc. 1) it is *disappointment*. The unfortunate Henry exclaims, when ill news comes from France :

Thus are my blossoms blasted in the bud
And caterpillars eat my leaves away.

In Hamlet it is overwrought feeling. The gentle Ophelia, mourning for the strange behaviour of her lover, says (Act III., sc. 1) :

And I, of ladies most deject and wretched,
That suck'd the honey of his music vows,
Now see that noble and most sovereign reason,
Like sweet bells jangled, out of tune and harsh
That unmatched form and feature of blown youth,
Blasted with ecstasy.

And in Romeo and Juliet it is death :

Two such opposed foes encamp them still
In man as well as herbs, grace and rude will ;
And, where the worser is predominant,
Full soon the canker death eats up the plant.

Other passages in which reference to the canker is made are Midsummer Night's Dream, Act III., sc. 2; 2nd Part of K. Henry IV., Act II., sc. 2, and Act IV., sc. 4; 1st Part of K. Henry VI., Act II., sc. 5; Coriolanus, Act IV., sc. 6; Romeo and Juliet, Act I., sc. 1.

In England the larva of one of the plume moths, *Pterophorus rhododactylus*, feeds in the buds of the rose. There is a variety of small moths that infest the blossoms, leaves and young shoots of the Queen of Flowers. Among them are :

GEOMETRINA.	TORTRICINA.	TINEINA.
<i>Articlea badiata.</i>	<i>Antithesia ochroleucana.</i>	<i>Lampronia quadripunctella.</i>
" <i>derivata.</i>	<i>Pardia tripunctana.</i>	<i>Colophora gryphipennella.</i>
<i>Cideria psittacata.</i>	<i>Spilonota roborana.</i>	
" <i>fulvala.</i>	" <i>rosacolana.</i>	
	<i>Hedya pauperana.</i>	
	<i>Crassia Bergmanniana.</i>	
	" <i>holmiana.</i>	
	<i>Peronea variegana.</i>	

Of larvae that feed upon the flower-buds of the apple, one of the most destructive is that of the Figure of Eight Moth (*Diloba ceruleocephala*), one of the Bombyces. This insect is so destructive that it was called by Linnaeus, the "Pest of Pomona." The larvae of the Winter Moth (*Chimatobia brumata*) are also very injurious. Immediately after they are hatched they make their way to the unopened buds and burrow in them, concealing themselves from sight. The Green Pug (*Eupithecia rectangularis*) is another objectionable insect:—"The larva feeding in the young buds of the apple-trees, devouring the stamens and pistils, and protecting itself by tying together the petals" (*Stainton's Manual*, Vol. II., p. 92). By the caterpillars of a tiny moth *Hyponomeuta padellus*, belonging to the Tineina, the apple-trees are not unfrequently entirely stripped of their foliage. Besides the insects already named, at least 15 species, belonging to the groups Tortricina and Tineina, infest the English orchards.

In King Richard II., by a striking metaphor England is represented as a disordered garden, over-run with caterpillars (Act III., sc. 4). Twice the word "caterpillar" is used by Shakespeare as one of contempt; in 1st Part of K. Henry IV., Act II., sc. 2, and in 2nd Part of K. Henry VI., Act IV., sc. 4.

I find the word "moth" used three times: In the *Merchant of Venice*, "Thus has the candle singed the moth," Act II., sc. 9; in *Othello* where Desde-

mona speaks of herself as a "moth of peace," Act I., sc. 3; and in *Coriolanus*, "You would be another Penelope, yet they say all the yarn be spun, in Ulysses absence, did but fill Ithaca full of moths," Act I., sc. 4. The reference in this last passage is probably to the tapestry moth, *Tinea tapetrella*.

DIPTERA.—The most numerous of Shakespeare's entomological allusions are to the two-winged flies. As a fitting image of littleness and meanness he makes use of the gnat, as where Simonides says that princes who are not given to hospitality :

Are like to gnats which make a sound, but killed,
Are wonder'd at.

Pericles, Prince of Tyre, Act II., sc. 3.

And where Biron mocking at the love-sick King of Navarre :

O me, with what strict patience have I sat
To see a king transformed to a gnat.

Love's labour's lost, Act IV., sc. 3.

But the diminutive is used with much feeling and affection, where Imogen speaking of the departure of her banished lord, says :

I would have broke my eye-strings; crack'd them, but
To look upon him; till the diminution
Of space had pointed him sharp as my needle,
Nay, follow'd him, till he had melted from
The smallness of a gnat to air.

"Cymbeline," Act I., sc. 4.

There is knowledge both of human nature and of natural history, in the rebuke which Antipholus of Syracuse administered to Dromio of Syracuse.

Because that I familiarly sometimes
Do use you for my fool, and chat with you,
Your sauciness will jest upon my love,
And make a common of my serious hours.
When the sun shines, let foolish gnats make sport,
But creep in crannies, when he hides his beams.

Comedy of Errors, Act II., sc. 2.

The Flea (*Pulex irritans*) is spoken of in at any rate seven passages:—"Henry V.," Act II., sc. 3, and Act III., sc. 7; "Merry Wives of Windsor," Act IV., sc. 2; "Twelfth Night," Act III., sc. 4; "All's Well that Ends Well," Act IV., sc. 3; "Taming the Shrew," Act V., sc. 3, and 1st Part K. Henry IV., Act II., sc. 1; always in a trifling sense.

Shakespeare's allusions to the breeze-fly or gad-fly of the ox (*Tabanus horinus*) are forcible. In Troilus and Cressida Nestor, replying to Agamemnon, to illustrate the difference between "valour's show" and "valour's worth," says that in Fortune's

— ray and brightness
The herd hath more annoyance by the brize
Than by the tiger; but when the splitting wind
Makes flexible the knees of knotted oaks,
And flies flee under shade, why then the thing of courage
As rous'd with rage, with rage doth sympathize.

Act I., sc. 3.

And in Antony and Cleopatra, Scarus cries out against the Egyptian Queen who was hastening from the fight off Actium :

Yon ribald-rid nag of Egypt

The brize upon her like a cow in June
Hoists sails and flies.

Of the many allusions to flies made by Shakespeare, some are used in a slighting and contemptuous sense, as when Timon of Athens calls his false friends

Most smiling, smooth, detested parasites,
Courteous destroyers, affable wolves, meek bears,
You fools of fortune, trencher friends, time's flies.

Act III., sc. 6.

Or when La Pucelle says of the dead Talbot, whom Sir W. Lucy had enquired for under many sounding titles :

Here is a silly, stately style indeed !
The Turk, that two and fifty kingdoms hath,
Writes not so tedious a style as this.—
Him, that thou magniest, with all these titles,
Stinking, and fly-blown, lies here at our feet.

1st Part of K. Henry VI., Act IV., sc. 7.

Occasionally the references are made vindictively, as when Iago exclaims :

— “ Call upon her father,
Rouse him ; make after him, poison his delight,
Proclaim him on the streets, incense her kinsmen,
And though he in a fertile climate dwells,
Plague him with flies.”

Othello, Act I, sc. 1.

At one time the fecundity of flies in hot weather, affords the poet an apt simile to denote the fickle populace :

Impairing Henry, strength'ning, mis-proud York,
The common people swarm like summer-flies ;
And whither fly the gnats but to the sun ?
And who shines now, but Henry's enemies ?

3rd Part of K. Henry VI., Act II., sc. 6.

At another it serves to indicate excessive conceit. Biron says of “ figures fantastical :”

— These summer flies
Have blown me full of maggot ostentation.
Love's Labour's Lost, Act V., sc. 2.

Often the allusion has a tragic ring, as when poor blinded Gloster cries in his despair :

As flies to wanton boys are we to the gods ;
They kill us for their sport.

King Lear, Act IV., sc. 1.

And when, in Cymbeline Sicilius Leonatus, addressing Jupiter, says :

No more thou thunder-master show
Thy spite on mortal flies.
Act V., sc. 4.

Among the references to flies are two that show how closely Shakespeare had observed these insects. In K. Henry V., Act V., sc. 1, he places in the mouth of the Duke of Burgundy the words :

Like flies at Bartholomew-tide, blind, though
They have their eyes ; and then they will endure handling,
Which before would not abide looking on.

St. Bartholemew's day comes on the 24th of August ; under the old style it would be September 4th, when the flies in the cool English autumn would be growing dull and sluggish. But an allusion shewing more close attention even than that is found in Othello, Act IV., sc. 2.

— O, ay, as summer flies are in the shambles,
That quicken even in blowing.

It is not every one who knows that the flesh-fly, *Sarcophaga carnaria* is ovo-viviparous ; but Shakespeare knew it.

The sheep-tick, *Melophagus ovinus* is mentioned once in the plays.

— I would rather be a tick in a sheep than such a valiant ignorance.
Troilus and Cressida, Act III., sc. 3.

Other references to flies will be found in The Tempest, Act III., sc. 2 ; As You Like It, Act IV., sc. 1 ; Winter's Tale, Act IV., sc. 3 ; King John, Act IV., sc. 1 ; 2nd Part K. Henry IV., Act III., sc. 1 ; 2nd Part of K. Henry VI., Act I., sc. 2 ; Troilus and Cressida, Act II., sc. 3 ; Antony and Cleopatra, Act II., sc. 2 and Act III., sc. 2 ; Cymbeline, Act IV., sc. 2 ; Titus Andronicus, Act III., sc. 2, and Act V., sc. 2 ; Pericles, Prince of Tyre, Act IV., sc. 1, and Act IV., sc. 4 ;

King Lear, Act IV., sc. 6; Romeo and Juliet, Act II., sc. 3, and Act II., sc. 4; Hamlet, Act II., sc. 2, Act IV., sc. 3, Act V., sc. 1, and Act V., sc. 2, and Titus Andronicus, Act IV., sc. 1.

COLEOPTERA.—Shakespeare's allusions to beetles are very fine and telling. What can be more so than this :

Ere to black Hecate's summons
The shard-borne beetle with his drowsy hum
Hath rung night's yawning peal, there shall be done
A deed of dreadful note.

Macbeth, Act III., sc. 4.

The expression "shard-borne," is not quite correct. The elytra of the beetle are uplifted during flight, it is true; but the gauzy wings that ply beneath them are the sustaining and propelling instruments. What particular species of beetle (if any), Shakespeare had in his mind when he penned these words we cannot tell. The Dor-beetle, *Geotrupes stercorarius*, is a striking object, and flies in the dusk, and may have attracted his attention.

Scarcely less beautiful than the reference given above, is that to *Lampyris noctiluca*:

The glow-worm shews the matin to be near
And 'gins to pale his ineffectual fire.

Ibid, Act I., sc. 1.

Another fine passage is found in Measure for Measure, Act III., sc. 1.

— Dar'st thou die?
The sense of death is most in apprehension;
And the poor beetle, that we tread upon,
In corporal sufferance finds a pang as great
As when a giant dies.

Here, of course the intention is not to give an increased idea of the pains of the beetle, but to make us think less of the death-throes of the giant—the giant suffers as little as the beetle.

What a conception of depth is conveyed to us in the words:

— How fearful
And dizzy 'tis to cast one's eyes so low!
The crows and choughs that wing the midway air
Show scarce so gross as beetles.

King Lear, Act IV., sc. 6

By Caliban in The Tempest, Act I., sc. 2, and by the fairies in Midsummer Night's Dream, beetles are spoken of as things to be dreaded.

In the 2nd Part of King Henry IV., Act II., sc. 4, there is a very curious metaphor:

His face is Lucifer's privy kitchen,
Where he doth nothing but roast malt-worms.

The malt-worms are the larya of *Tenebrio molitor* and *Tenebrio obscurus*.

Other references to beetles will be found in Midsummer Night's Dream, Act III., sc. 1; Taming of the Shrew, Act IV., sc. 1; Antony and Cleopatra, Act III., sc. 2; and Cymbeline, Act III., sc. 3.

HEMIPTERA.—In the Merry Wives of Windsor, Act I., sc. 1, is an amusing play upon the word "luce." Slender exalting Robert Shallow, "Justice of the Peace and *coram*," and "cunct-*alorum*," and "ratu-*lorum*," and "armigero," says:

All his successors, gone before him, have done 't; and all his ancestors that come after him, may; they may give the dozen white luces in their coat.

To which Sir Hugh Evans, the Welsh chaplain replies:

The dozen white louses do become an old coat well, it agrees well passant; it is a familiar beast to man, and signifies—love.

The passage shews that Shakespeare had not forgotten his early escapade, and angry slur upon Sir Thomas Lucy of Charlecote:

If lousy is lucy, as some folks miscall it,
Then Lucy is lousy whatever befall it.

The "luce" is, of course, the fleur-de-lis, or flower-de-duce, and the "coat," Robert Shallow's coat of arms. In the association of the "familiar beast," with "love," we are reminded of the "lousy and lecherous" of one of our modern ballad-writers.

Shakespeare makes at least eight allusions to the louse. One of them conveys the strongest expression of contempt that can possibly be imagined: "I care not to be the louse of a lazard." (*i. e.* of a man afflicted with loathsome diseases). *Troilus and Cressida*, Act V., sc. 1.

ORTHOPTERA.—"Shall we be merry?" asks Prince Henry in 1st Part of K. Henry IV., Act II., sc. 4. "As merry as crickets," answers Poins. The cheerful note of the cricket (*Acheta domesticus*), produced by the rubbing together of the notched edges of the insect's upper wings, must have been a familiar sound to Shakespeare. When all is quiet around the hearth the note arises in many an English dwelling. But a very slight noise will startle the insect, and cause a cessation of its music. So the little Mamillius in a Winter's Tale, says that he will tell his story *so softly*, that "yon crickets shall not hear it," Act II., sc. 1.

Amongst the equipments of Queen Mab is a "whip of cricket bone." *Romeo and Juliet*, Act I., sc. 4. The "winter cricket" is spoken of in the *Taming of the Shrew*, Act IV., sc. 3.

I find but one allusion to locusts—that made by Iago when speaking of Othello and his countrymen.

These Moors are changeable in their wills:—fill thy purse with money; the food that to him now is as luscious as locusts, shall be to him shortly as bitter as coloquintida.—*Othello*, Act I., sc. 3.

The species mentioned here is doubtless *Edipoda migratorius*, which often visits Morocco, and is used for food.

The grasshopper is mentioned in *Romeo and Juliet* Act I., sc. 4, where the cover of Queen Mab's wagon is said to be made of the wings of grasshoppers.

ARACHINIDA.—In the *Merchant of Venice* we have an instance of the skill with which the great poet could draw, even from the work of a disgusting insect, a fitting illustration to enhance the attractions of an admired lady.

— Here, in her hair,
The painter plays the spider, and hath woven
A golden mesh, to entrap the hearts of men,
Faster than gnats in cobwebs.

Act III., sc. 2.

A different kind of weaving is spoken of in the 2nd Part of K. Henry VI., Act III., sc. 1:

My brain more busy than the labouring spider
Weaves tedious snares to trap mine enemies.

And in *Othello*, Act II., sc. 1, where Iago says to himself,

With as little a web as this
Will I ensnare as great a fly as Cassio.

And yet again in K. Henry VIII., Act I., sc. 1, where it is said of Wolsey:

— Spider-like
Out of his self-drawing web, he gives us note
The force of his own merit makes his way.

With wonderful effect Shakespeare makes use of the Spider in shewing the power of imagination.

There may be in the cup
A spider steep'd, and one may drink, depart,
And yet partake no venom; for his knowledge
Is not infected: but if one present
The abhor'd ingredient to his eye, make known
How he hath drank, he cracks his gorge, his sides,
With violent hefts:—I have drunk and seen the spider.

Winter's Tale, Act II., sc. 1.

In Troilus and Cressida, Act V., sc. 2, is a reference to Arachne. Arachne, according to the ancients, was the daughter of Idmon, a Lydian. She was a skilful spinner, and contended with Pallas. Defeated and chagrined, she hanged herself, and was turned into a spider.

In King John, Act IV., sc. 3, Hubert suspected of murdering Prince Arthur, is told that

The smallest thread,
That ever spider twisted from her womb,
Will serve to strangle thee.

Other passages referring to spiders may be found in Midsummer Night's Dream, Act II., sc. 3; King Richard II., Act III., sc. 2; King Richard III., Act I., sc. 2, and Act II., sc. 4; Cymbeline, Act IV., sc. 2; King Lear, Act IV., sc. 6; Romeo and Juliet, Act I., sc. 4, and Act II., sc. 6.

Scorpions are spoken of in Macbeth, Act III., sc. 4; 2nd Part of K. Henry VI., Act III., sc. 2; and Cymbeline, Act V., sc. 5.

It is evident that Shakespeare, in his walks around Stratford and on the pleasant banks of Avon, had found food for reflection in the appearances and habits of the commoner insect tribes. His were the observing eye and the contemplative mind: and with marvellous power he turned the knowledge of insect-life that he acquired to account, for the instruction and amusement of the men of his own day, and of after generations. He was one who could find

Tongues in trees, books in the running brooks,
Sermons in stones, and good in everything.

And we are happy in that he has, in so many instances, interpreted these tongues, translated these books, written down the sermons and pointed out the good for us.

ENEMIES OF THE GRAIN APHIS.—Prof. H. Garman, Entomologist and Botanist of the Kentucky Agricultural Experiment Station, in a paper on the grain louse (*Siphonophora avenae*) has the following to say about its natural enemies:

The helplessness of plant lice makes them the prey of many predaceous and parasitic insects. A visit to infested wheat fields in June showed great numbers of these present among the lice. Undoubtedly the injury to grain was very much lessened by the work of these friends of ours, yet, as we have shown, lice still exist in the fields, and they are liable again to assume destructive numbers.

Chief among the enemies of the grain louse are certain small, dark-coloured, four-winged flies, which belong to the same order as the common honey bee. These little flies deposit their eggs in the bodies of the plant lice, placing a single egg in each louse, and from the eggs come small grubs which live in the interior of their host, finally emerging after its death as egg-laying flies. Grain lice infested with these grubs become swollen, assume a brown colour, and by some means are fastened to the plants, where they remain as empty skins after the parasite emerges.

Small two-winged flies, about five-sixteenths of an inch long, with brassy brown thorax, and with the abdomen striped crosswise with black and yellow, also do good service in destroying the lice. They scatter their eggs among the colonies, and from these hatch greenish larva, which destroy the lice by seizing them and sucking their juices.

The lady bugs in both larval and adult stages devour the lice bodily. Several species of these beetles were common in the fields, but the most conspicuous from

size and abundance, was the nine-spotted lady bug (*Coccinella 9-notata*). It may be recognized by the arrangement of the nine black spots on the brown wing covers—four on each side, the ninth just behind the thorax and overlying the middle line. It is very nearly a half sphere in shape. The other species are like it in general shape, but differ in details of colour and markings. A small list of other insects which do more or less good in destroying the aphides could be given, but this will suffice to give an idea of the more abundant and useful of our insect friends.

Birds have been thought to destroy the lice, but I have seen no evidence of their doing so. Most birds depend on larger insects, and it is only occasionally that the small species, such as warblers, eat plant lice of any kind. Excepting the Maryland yellow-throat, birds of this family rarely occur in our grain fields, so that we can hope nothing from their help. The English sparrow, with its clumsy beak and grain-eating propensity, certainly does no good in this direction.

EXPERIMENTS WITH ARSENITES.—In the Bulletin of the Iowa Agricultural Experiment Station for August, 1890, Prof. Gillette gives an elaborate and interesting account of a series of experiments that he carried out for the purpose of testing the use of arsenites in the warfare against noxious insects.

"Paris green, he says, was brought into prominence as an insecticide for the first time in this country in 1869, and London purple in 1877. Arsenious acid (white arsenic) was successfully used for the destruction of the Canker-worm as early as 1875 and is still frequently recommended for the destruction of insects. During these years the arsenites have arisen to the first rank as insect destroyers. They have been largely experimented with by entomologists and widely used by farmers and fruit-growers, and yet there is much difference of opinion as to the proportions in which each may be safely applied to different plants for the destruction of insects. In fact a serious obstacle in the way of a more free and successful use of the arsenites has been their liability to injure tender foliage, even when applied very dilute. In the experiments of the past two seasons, herein reported, I have given much attention to the finding of some method of applying these poisons so as to prevent injury to foliage without lessening their effectiveness in destroying insect life, and the success met with in this direction has been most gratifying. I also give the results of experiments to determine relative injuries to foliage from applications of the arsenites when freshly mixed and when allowed to stand a few days before being applied; to show the effect upon foliage by adding paste or soap to arsenical mixtures; to show the effects of sun, dew and rain upon foliage treated with arsenical mixtures; to show whether or not it is practical and safe, so far as injury to the plant is concerned, to mix the arsenites with insecticides that kill by external contact; and to show the effects of combining the arsenites with fungicides."

After giving a detailed account of his various experiments, he arrives at the following conclusions:—

"1. *The oldest leaves are most susceptible to injury from arsenical applications. They often turn yellow and drop without showing the burnt spotted appearance.**

"2. *Dews, and probably direct sunlight, increase the injuries done by the arsenites to foliage.*

* I have put in italics those conclusions that seem to me to be well proven from the experiments here reported. Concerning the others there is some doubt, and further experiments are necessary to determine positively the facts.

3. Leaves kept perfectly dry can hardly be injured by the arsenites, even when they are applied very abundantly.

4. Applications made in the heat of the day and in the bright sunlight do not injure foliage more than when applied in the cool of the day.

5. The only effect of a heavy rain or dashing shower following an application of one of the arsenites is to lessen the injury to foliage.

6. Leaves suffering from a fungous disease are more susceptible to injury than are healthy leaves.

7. When freshly mixed and applied, London purple is most and white arsenic is least injurious to foliage.

8. White arsenic in solution should not be used upon foliage without first adding lime, Bordeaux mixture or some other substance to prevent its injurious effects upon foliage.

9. White arsenic, if allowed to stand many days in water before being applied, will do far greater harm to foliage than if applied as soon as mixed.

10. Lime added to London purple or Paris green in water greatly lessens the injury that these poisons would otherwise do to foliage.

11. Lime added to a mixture of white arsenic in water will greatly increase the injury that this poison would otherwise do to foliage. If the arsenic is all in solution, the lime will then lessen the injury, as in the case of London purple or Paris green.

12. London purple (Paris green and white arsenic have not yet been tried) can be used, at least, eight or ten times as strong without injury to foliage if applied in common Bordeaux mixture instead of water.

13. The arsenites cannot by any ordinary method be successfully mixed in a kerosene emulsion.

14. The arsenites mix readily in resin compounds and do not seem to be more injurious to foliage than as ordinarily applied in water.

15. The arsenites in strong soapy mixtures do considerably more damage to foliage than when applied in water only.

16. The arsenites mix readily in carbonate of copper solution and do not seem to do more harm than when applied in water only.

17. London purple in sulphate of copper solution does vastly more harm than when applied in water only.

HONEY BEES AND ARSENICALS USED AS SPRAYS.—Mr. H. O. Kruschke, of Juneau county, Wisconsin, in the *American Garden* for January, 1890, p. 57, warns prospective sprayers that the first man caught applying arsenic to trees in full bloom will be prosecuted—reasoning that the spraying of such trees will result in the storage by the bees of poisoned honey, the consumption of which will be dangerous.

In our Report for last year, (1889, page 87) we quoted from *Inset Life* an account from Prof. Webster of the spraying of fruit trees without any ill results to either bees or honey. "The prevailing belief," says *Inset Life*, "is, however, the other way, and cases are on record where serious destruction of bees has resulted from spraying. In the case of the apple, particularly, the application should not be made until the bloom has begun to fall, when no injury will be

likely to result. It was because of the possibility of danger that in the beginning we were very slow to recommend the wholesale spraying of orchards with the arsenical mixtures, but experience has shown here, as in other cases, judicious and cautious use is attended only with benefit, and that the possible harm is reduced to such a minimum as to almost justify its being left out of consideration."

ANT HILLS AND SLUGS.—I have resorted to many expedients to get rid of the ant hills that disfigure my lawn and sometimes seriously injure plants and shrubs, and have finally succeeded in conquering them. I first hive them,—break up the nest pretty thoroughly and if it is near the roots of a plant draw as much of the débris as possible a little way from it and turn over it a large plant jar. The ants will promptly appropriate the jar, remove their larvae to it, and fill it with pellets of earth. I then drench this with kerosene emulsion reduced to a strength of 2 to 3 per cent., which will kill every ant thoroughly drenched with it. It is more destructive to them than pure kerosene, which does not adhere to them. In this way I have thoroughly conquered the ants.

The rose slug and the currant worm I keep completely under by use of hellebore, a tablespoonful to a gallon of water, and forcing it violently among the foliage with a hydropult. Commencing in the spring before I can find a slug or a worm, and repeating the drenching once a week for three or four weeks, I can destroy them completely before they do any damage. On one hundred roses I was able this spring to find only two slugs, while the foliage of some common sorts I did not spray was completely destroyed.—[M. C. Read, Hudson, Ohio, *n Insect Life*.

GOOD INSECTIVOROUS BIRDS.—The following birds are to be classed among the most helpful kinds in the general warfare against insects: Robins, for cut and other earth worms. Swallows, night-hawks and purple martins, for moth catchers. Pewees, for striped cucumber bugs. Wood thrushes and wrens, for cut worms. Cat birds, for tent caterpillars. Meadow larks, crows and wood-peckers, for wireworms. Blue-throated buntings, for canker worms. Black, red-winged birds, jays, pigeons, doves, and chippies—strawberry pests. Quail, for chinch bugs and locusts. Whip-poor-wills, for moths. Hawks, all night birds, owls, tanagers, black-winged summer red birds, etc.—cuculios. There may also be mentioned the following insect pest destroyers: Indigo birds, nut crackers, fly catchers, chimney swifts, chipping and song sparrows, black birds, mocking birds and orioles.

There is little doubt that for every bird which is injurious to fruit that is killed, there are a hundred killed that are beneficial. Of course the whole life of the bird must be considered, for very many are fruit eaters. The only question is, does the bird, on the whole, do most damage or good?

The man who indiscriminately kills the birds in his orchard and berry patch is not fit to live, and he will surely lose more than he will gain even from a financial point of view.—*Prairie Farmer*.

RESISTANCE TO COLD BY A CATERPILLAR.—Mr. Otto Dugger, St. Anthony Park, Minn., gives in *Insect Life* the following instance of resistance to extreme cold by a caterpillar of the Dusky Spilosoma (*S. fuliginosus*, Linn):—"December 3, 1889. Found to-day in a little depression of the soil a clear cake of ice, and

imbedded in it the larva of the above species. By means of a hot iron I separated a cube of ice with the inclosed larva, and took it to my office. The caterpillar was entirely and solidly inclosed by the ice: no air-spaces could be detected among the hair. How long the caterpillar had been inclosed I could not say. Left the cube of ice in front of my window, where the temperature sunk for two days to 11° below zero. Later the weather moderated, and during the day a little ice would melt near the caterpillar, but never exposing it to the air. After being inclosed for fourteen days, I carefully melted the ice and removed the caterpillar to a piece of blotting paper. In less than thirty minutes the larva was crawling about, not injured in the least. Yet, to escape further experimentation, it has shown good sense and spun up, and transformed into a pupa, healthy to all appearances."

SAW-FLY BORER IN WHEAT.—Prof. J. H. Comstock, Entomologist, Cornell University, Ithaca, N. Y., describes a new saw-fly working in wheat, known as *Cephus pygmaeus*, order Hymenoptera, of the family Tenthraclinidae as follows:

An insect destructive to wheat, but previously unknown in this country, has appeared in considerable numbers on the Cornell University farm. I do not know of its occurrence anywhere else in this State; but as it is extremely abundant here, it is doubtless spread over a considerable area. It was first observed in this locality two years ago by one of our students, the late Mr. S. H. Crossman while making an investigation of wheat insects. Mr. Crossman's studies, however, were sadly terminated before he had carried his investigations of this species very far; and it has fallen to me to continue the work begun by him.

On examining the stalks of wheat at harvest time by splitting them throughout their length, it was found that some of them had been tunnelled by an insect larva. This larva had eaten a passage through each of the joints so that it could pass freely from one end of the cavity of the straw to the other. In addition to tunnelling the joints they had also fed more or less on the inner surface of the straw between the joints; and, scattered throughout the entire length of the cavity of the straw, except the smaller part near the head, were to be seen yellowish particles, the excrement of the insect.

If infested straws be examined a week or ten days before the ripening of the wheat, the cause of this injury can be found at work within them. It is at that time a yellowish, milky-white worm, varying in size from 1-5 inch (5 mm.) to $\frac{1}{2}$ inch (12 mm.) in length. The smaller ones may not have bored through a single joint: while the larger ones will have tunnelled all of them, except, perhaps, the one next to the ground.

As the grain becomes ripe the larva works its way towards the ground, and at the time of the harvest the greater number of them have penetrated to the root. Here in the lowest part of the cavity of the straw they make preparations for passing the winter, and even for their escape from the straw the following year. This last is done by cutting the straw circularly on the inside, nearly severing it a short distance, varying from one-half inch to one inch from the ground. If the wheat were growing wild, the winter winds would cause the stalk to break off at this point, and thus the insect after it had reached the adult stage in the following year could easily escape: while but for this cut, it would be very liable to be imprisoned within the straw. But under ordinary circumstances the straw is cut by the reaper before it is broken off at this point, and consequently that breaking off does not occur. If, however, there is a strong wind just before the harvest and after the straws have been cut in this manner by the insects, they

are very liable to break off; the lodging of the grain may, therefore, be largely due to the injuries of this insect. In one field just before the harvest I observed a large number of isolated straws lying in a horizontal position; there was not the general breaking down of the grain characteristic of wind and rain; but distributed through the grain that was standing there was a large number of isolated straws that were lodged. A careful examination showed that this breaking down of the grain, in 45 per cent. of the cases, was directly due to the injuries of this insect. In many cases the straws had been broken off a considerable distance above the ground, and before the larva had made the characteristic circular cut near the root. An examination of these straws showed that the larva had eaten all, or nearly all, of the softer inner part of the straw for a short distance, thus making a weak place which was easily broken. As a rule, however, the larva obtains a greater part of its nourishment by tunnelling the joints of the straw and does not eat enough of the straw in any place to cause it to break until it makes the circular cut near the ground described above.

After the circular cut has been made, the larva fills the cavity of the straw just below it for a short distance with a plug of borings. Between this plug and the lower end of the cavity of the straw there is a place measuring about one-half inch in length (10 mm. to 15 mm.) It is here that the insect passes the winter. Immediately after cutting the straw and making this plug the larva makes a cocoon by lining the walls of this space with a layer of silk. This layer is thin but very firm and more or less parchment-like; it can, however, be broken with slight difficulty, being somewhat brittle.

Within this cocoon, which remains in the stubble after the grain is cut, the insect passes the winter, in the larval state. It changes to a pupa during March or April; and sometime during the month of May the adult insect appears.

The exact date of the appearance of the insect depends upon the nature of the weather. This year from pupæ collected on the 23rd of April and brought into the Insectary, the adults emerged from the 8th to the 10th of May; while the insects left in the fields were ten days later in emerging.

The adult insect is a four-winged fly belonging to the order *Hymenoptera*, the order that includes the bees, wasps and ants; and it is a member of the family *Tenthredinidae* of this order, a family comprising the insects commonly known as saw-flies. This popular name refers to the fact that in this family the female insects are furnished with a more or less saw-like organ. This arises near the caudal end of the body, and is the ovipositor. By means of it the insects are able to make incisions in the tissues of plants for the reception of their eggs.

In the *Canadian Entomologist*, 1890, p. 40, Mr. Harrington records the occurrence of this insect at Ottawa, Ont., and also at Buffalo, N. Y.

THE HABITS OF A GROUND-HORNET.—*Stizus speciosus* is the largest native ground-hornet, and its formidable appearance and great activity generally secure it undisputed possession of the square rod where it happens to alight. It is from an inch to an inch and one half in length; the head and thorax are brown and the abdomen is black with six irregular yellow blotches. These markings are discernible as it flies swiftly about its business and give it a particularly tiger-like appearance. It seems to be afraid of nothing, and if you walk near its burrow it flies with a menacing buzz in circles about you, and its brown, black and yellow body gleams in the sunlight.

In constructing its burrows it usually selects a country road side or a dry barren hill, where a freedom from roots makes digging less laborious.

On the hill back of Richmond village, on Staten Island, I have seen them carrying heavy harvest flies to these burrows, several of which are dug there nearly every summer. The task of carrying so great a burden as a Cicada is a particularly laborious one, and they do not fly very fast when thus heavily laden. Sometimes they drag the harvest-flies a distance along the ground, and sometimes they resort to an ingenious method to finally get them to their burrows.

In August, 1889, I observed a Stizus carrying a Cicada and flying slowly up a hill side. It lit at the base of a black birch on the hill top, and dragged the harvest-fly, holding the smooth dorsal surface to the bark, to the topmost branches finally disappearing among the leaves. I did not see it leave the tree, for I was unable to command a view on all sides at the same time, and then there was a neighboring birch whose branches interlocked with the one where the hornet was. I satisfied myself that it did leave, by climbing up and violently shaking the branches and tree top. Stizus employs this method of transporting the heavy Cicada; it climbs the tree with the insect, and then flies from the branches, the excessive weight gradually bringing it to the ground again but nearer to its burrow.

Professor Morse, in his annual address before the American Association in 1887, notices the following:—Dr. Thomas Meehan describes a hornet that was gifted with great intelligence. He saw this insect struggling with a large locust in unsuccessful attempts to fly away with it. After several fruitless efforts to fly up from the ground with his victim, he finally dragged it fully thirty feet to a tree, to the top of which he laboriously ascended, still clinging to his burden, and having attained this elevated position he flew off in a horizontal direction with the locust."

Commenting upon this, Mr. C. G. Rockwood, jr., in Science for August 19th, 1887, gives an account of a large insect evidently of the wasp family, that carried a Cicada for a distance of twenty feet up a maple tree and then flew away with it as described above.

Wishing to ascertain the relative weights of these insects, I had dried specimens, including pins, weighed in a druggist's scales. *Cicada tibicen* weighed thirteen grains and *Stizus speciosus* seven and one half.—W. T. DAVIS, Tompkinsville, Staten Island, N. Y.

EXPERIMENTS FOR THE DESTRUCTION OF CHINCH BUGS.

BY PROF. F. H. SNOW, UNIVERSITY OF KANSAS, LAWRENCE.

These experiments have been continued through the two seasons of 1889 and 1890 and have been remarkably successful. As entomologist to the Kansas State Board of Agriculture I had prepared an article for the annual meeting of that Board in January, 1889, stating what was known at that time upon the subject, and calling attention to the investigations of Professors Forbes, Burrill and Lugger. In June, 1889, a letter was received from Dr. J. T. Curtiss, of Dwight, Morris County, Kansas, announcing that one of the diseases mentioned in the article (Entomophthora) was raging in various fields in that region, and stating that in many places in fields of oats and wheat the ground was fairly white with the dead bugs. Some of these dead bugs were at once obtained and experiments were begun in the entomological laboratory of the University. It was found that living healthy bugs, when placed in the same jar with the dead

bugs from Morris County, were sickened and killed within ten days. A Lawrence newspaper reporter learning of this fact published the statement that any farmers who were troubled by chinch-bugs might easily destroy them from their entire farms by sending to me for some diseased bugs. This announcement was published all over the country, and in a few days I received applications from Agricultural Experiment Stations and farmers in nine different States, praying for a few "diseased and deceased" bugs with which to inoculate the destroying pests with a fatal disease. Some fifty packages were sent out during the season of 1889, and the results were in the main highly favorable. It was my belief that sick bugs would prove more serviceable in the dissemination of disease than dead bugs. I accordingly sent out a circular letter with each package, instructing the receiver to place the dead bugs in a jar for 48 hours, with from ten to twenty times as many live bugs from the field. In this way the disease would be communicated to the live bugs in the jar. These sick bugs being deposited in different portions of the field of experiment would communicate the disease more thoroughly while moving about among the healthy bugs by which they would be surrounded. This belief was corroborated by the results. This disease was successfully introduced from my laboratory into the States of Missouri, Nebraska, Indiana, Ohio and Minnesota, and into various counties of the State of Kansas. A report of my observations and experiments in 1889 has been published in the transactions of the Kansas Academy of Science, vol. XII., pp. 34-37, also in the report of the proceedings of the Annual Meeting of the Kansas State Board of Agriculture in January, 1890.

The next point to be attained was the preservation of the disease through the winter, in order that it might be under my control and be available for use in the season of 1890. To accomplish this result, I placed fresh healthy bugs in the infection jar late in November 1889, and was pleased to note that they contracted disease and died in the same way as in the earlier part of the season. I was not able to obtain fresh material for the purpose of testing the vitality of the disease germs in the spring of 1890, until the month of April, and then only a limited supply of live bugs could be secured. I quote the following from my laboratory notes :

April 10: twenty-five chinch-bugs that had hibernated in the field were put in the infection jars. They were supplied with young wheat plants. The bugs appeared lively and healthy.

April 16: some of the bugs were dead and all appeared stupid.

April 20: all of the bugs were dead.

One week later, a new supply of fourteen bugs was put into the jar; they were supplied with growing wheat. They ran substantially the same course as the first twenty-five. Some had died at the end of the first week and all were dead by the end of the thirteenth day.

The chinch-bug seemed to have been very generally exterminated in Kansas in 1889, and only three applications for diseased bugs were received in 1890 up to the middle of July. On account of the limited amount of infection material on hand, I required each applicant to send me a box of live bugs, which I placed in the infection jars, returning in a few days a portion of the sick bugs to the sender. The three applicants above noted reported the complete success of the experiments. I give the following letter from Mr. M. F. Mattocks, of Wauneta, Chautauqua County, Kansas :

Wauneta, Kansas, July 7, 1890.

DEAR SIR:—I received from you a few days since, a box of diseased chinch-bugs. I treated them according to instructions, and I have watched them closely, and find that they have conveyed the disease almost all over my farm, and bugs are dying at a rapid rate. I have not found any dead bugs on farms adjoining me. I here enclose you a box of healthy bugs that I gathered $1\frac{1}{2}$ miles from my place; I do not think they are diseased. Yours, M. F. MATTOCKS.

I also quote the following clipping from the Cedar Vale (Chautauqua Co.) *Star*:

INFECTING CHINCH-BUGS.—There is no longer any need of having our crops destroyed by chinch-bugs. A remedy that is sure as death and costs nothing, has been discovered and is used in this country with complete success. Mr. M. F. Mattocks, living a mile and a half east of Wauneta, on the H. P. Moser farm, is entitled to the credit of demonstrating in this part, the efficiency of the remedy. He was about to lose his corn crop by the bugs that were swarming into it from the stubble. He sent to Chancellor F. H. Snow, of the State University at Lawrence, and from him received a box containing a half-dozen diseased bugs. With them he exterminated a forty acre field full of the pests. They have died by the millions, in fact, they have about all died from the infection of those six bugs. A little circular of instructions, which he followed out, came with them. The six bugs were placed in a bottle with three or four hundred from the field, and were left together thirty-six hours and then turned loose, both the living ones and the dead, in the field. Devastation followed, and Mr. Mattocks will be troubled no more with chinch-bugs this year. If your crop is in danger you can save it by the same means of getting the diseased bugs in your field. It will cost you nothing and is a dead sure remedy. He has been sending dead and infected bugs to others in the country and to Prof. Snow, whose supply was running down.

I personally visited Mr. Mattocks's farm and verified the above statements.

The difficulty of obtaining enough live bugs to experiment with in the laboratory led to the sending out of the following advertisement, which was sent out to twenty prominent papers with requests for its publication:

WANTED! CHINCH-BUGS!

Prof. F. H. Snow, of the University of Kansas, is in great need of some live and healthy chinch-bugs with which to carry on his experiments in chinch-bug infection. Anyone who will send a small lot of bugs to Prof. Snow, University of Kansas, Lawrence, Kansas, will confer a favor on the investigator, and, it is hoped, on the farmers of Kansas.

This request for live bugs was given wide circulation and resulted in keeping the laboratory fairly well supplied with material for experiment.

Before the close of the season of 1890, it became evident that there were at least three diseases at work in our infection jars, the "white fungus" (Entomophthora or Empusa), a bacterial disease (Micrococcus), and a fungus considered by Dr. Roland Thaxter to be *Isaria* or perhaps more properly *Trichodermia*. *

The following report which describes the bugs as "collecting in clusters" points to the bacterial disease as the cause of destruction:

PIQUA, Woodson Co., Kansas, 7th December, 1890.

DEAR SIR.—Since writing you from Humboldt, Ks., the 6th inst., I have made the happy discovery that the germs of contagious diseases sent me were vital. On Sunday last upon examination of the millet field I found millions of dead bugs. They were collected in clusters. My idea is that dampness facilitates the spread of the contagion. The first distribution of diseased bugs two days after I received the package by mail apparently produced no results. A part of them were retained in the infection jar (quart Mason fruit jar); half a pint of bugs were collected from the field; three days later a foul stench was found to emanate from the jar, and a part of the bugs in it were dead. On July 3rd I took advantage of the cool damp evening and took a few buckets of cold water and sprinkled the edge of the millet and distributed more infected bugs. On the 6th I found millions of dead bugs. I think the night and sprinkling the millet caused the disease to spread. We have had no rain in this neighborhood since June 17th, if I remember correctly. The depredations of chinch-bugs are always more serious in dry, hot weather. You have conferred a lasting benefit on the farming interests of the United States, the value of which cannot be estimated in dollars and cents. It was estimated that during one of the visitation years of this insect the damage in the Mississippi valley amounted to ten millions of dollars. I have no doubt that by a proper manipulation of the contagious disease in the hands of intelligent persons it will prove an effective remedy. I think the contagion should be introduced among them early to prevent the migration of the young brood. In my case I received it too late. Early sown millet presents a favorable place to infect the bugs, as they seem to collect in the shade and die. Hoping that when the next Legislature meets an appreciative public will suitably reward you for your beneficent discovery, I am gratefully yours, W. J. McCormick.

The field experiments were apparently equally successful in the months of July, August and September. The following August field-report is inserted as a fair sample of the manner in which the farmers themselves regard these experiments:

FLORENCE, Marion Co., Kansas, November 1st, 1890

DEAR SIR.—On the 20th of August (I think it was) I wrote to you to send me some infected chinch bugs, and on the 30th of the same month you sent me a small lot of infected bugs, I suppose about thirty in all. I then put with these about twenty times as many healthy ones and kept them forty-eight hours, and then deposited them in and through my field—I have about 55 acres under cultivation.

At the time I wrote for bugs my place was all in corn and a very large crop of chinch bugs. I am safe in saying that there were more bugs on my farm than on any two farms with the same amount of land under cultivation. At the time of sending to you for bugs I told two of my neighbors of my intention, and they laughed at the idea, nevertheless I sent. When I put them in my field it had rained fully a half day, and after noon I commenced to place them about in different places in my field. I noticed no change in the bugs for three days, it being cold. On the fourth and fifth days the weather was more warm, and it was then that the destruction of the enemy commenced with great satisfaction to myself and great surprise to my laughing neighbors. One of my neighbors, Mr. George Winchester, said that there ought to be a subscription raised and donated to me. I told him not to me but to you the praise belonged. I think that it took about eight days after the five from the time that I placed them in my field before they were all destroyed. The fifth day after I put out the diseased bugs I noticed that a great many bugs were flying away from my place. I cannot say if the disease spread in this way or not, or if it spread at all. Three or four persons said they would come and procure of me some of the dead bugs, but no one came. This much I can say, with me this experiment has been a complete success. It has done me a great deal of good. I cannot give it a money value, but am satisfied that had it not been for the infected bugs obtained of you that I would have lost twenty-seven acres of wheat and eight acres of rye, and when I wrote to you for bugs I then contemplated putting out considerable wheat, and I was at that time considerably troubled about the bugs in my corn, thinking that if I put out any wheat at all it would be destroyed by bugs; but thanks to you my wheat is now safe from bugs, at least those that were on my place before sowing my wheat. I only wish that I had written to you sooner than this. I will send by express one bottle of bugs that I gathered after they commenced to die. Respectfully yours, JOHN KNOBLE.

The following report from R. L. Stangaard is inserted as being of a more scientifically circumstantial character than most of the other reports:

FLORENCE, Kan., Aug. 22nd, 1890.

DEAR SIR.—In reply to your favor of July 27th, I would say that infected bugs were applied, after they were kept with live ones about forty-two hours. Most of the bugs mixed were dead when taken out of the box. They were applied in seven different hills, being put into every ninth hill. I marked every hill with a number so as to be better able to watch the progress. Examined after forty-eight hours application with the following results:—No. 1, mostly dead. No. 2, bugs mostly alive, seemingly very restless. No. 3, bugs seem to be sick. No. 4, bugs mostly dead. On hills around this one bugs seem to be restless. No. 5, not examined. On hills around it the bugs seem to be sick. Examination eight days after application with the following results:—No. 3, bugs seemingly in a dying condition. On the hills around it the bugs seem to be well with exception of one hill where they seem to be dying and some dead. No. 4, not a live bug in the hill. No. 5, apparently dying, also dying in the hills around this. No. 6, bugs dying in hill. No. 7, apparently not dying. On August 16th, twelve days after application, I found the bugs to be dying and dead all through the field twelve acres. On August 20th, I again found the bugs to be dying rapidly. A field being forty rods distant had sure marks of bugs in a dying condition. What I mean by bugs being in a dying condition is this: they lay on their backs, almost motionless, and others lay in same position, moving limbs violently. This remedy was applied on A. G. Rostere's farm on Bruno creek, Marion Co., Kansas, being nine miles east and three miles south of Marion. Thanking you for your favors, I remain, yours truly, R. L. STANGAARD.

The laboratory experiments have been continued through the season. Of the three diseases identified, that produced by the *Trichoderma* appears to be less fatal than the other two, as is indicated by the following laboratory notes:

September 28th, dead chinch-bugs showing no signs of fungus externally were taken from the infection jars and crushed on a glass slide in distilled water. Oval hyphal bodies of a fungus (*Trichoderma*) were found in considerable number. These were put under a bell jar.

September 29th, some of the hyphal bodies had put out slender mycelial growths; others in immense numbers were multiplying by division.

October 1st, the hyphal bodies were still multiplying by division. The mycelial growths had become much longer and in some instances had variously branched.

October 3rd, a dead chinch-bug taken from an infected field was crushed on a glass slide in distilled water. Both round and oval hyphal bodies were found in considerable numbers. The severe put under a bell jar to prevent dying.

October 4th, both round and oval hyphal bodies were multiplying by division and were putting out mycelial growths.

October 5th, fresh chinch-bugs from an uninfected field were immersed in the liquid containing the above fungi and were put in a new jar with young corn plants.

October 16th, many of the bugs were dead; the others apparently lively. The dead bugs were found to contain hyphal bodies similar to those with which they were infected. A live chinch-bug from the same jar was crushed and found to contain round hyphal bodies; but these refused to germinate.

November 5th, not all of the bugs are yet dead. The few remaining are apparently lively.

The following is a summary of the results of the field experiments in the season of 1890:

Number of boxes of diseased bugs sent out, 38. Seven of these lots were either not received, or received and not used. Reports were received from 26 of

the 31 remaining cases. Of these 26 reports, 3 were unfavorable, 19 favorable, and 4 doubtful, concerning the success of the experiment. These doubtful cases are not to be looked upon as unfavorable, but more evidence is needed to transfer them to the list of favorable reports. These 19 out of 26 reports, or 75 per cent., were decidedly favorable. The experiments will be continued during the season of 1891.

In presenting this paper I wish to acknowledge the invaluable aid continually received during the progress of the work from my assistants, Messrs. W. C. Stevens and V. L. Kellogg.

BOOK NOTICES.

BUTTERFLIES OF NORTH AMERICA. Third Series—Part X. By W. H. Edwards.

The last part of Mr. Edwards's superb work has just come to hand. It is of exceptional beauty and interest. Special attention has been lately called to the American species of the genus *Argynnис*, by the publication of Mr. H. J. Elwes's "Revision of the genus *Argynnис*." (Trans. Ent. Soc. Lond. 1889. Part IV.) and Mr. Edwards's "Notes" thereon (Can. Ent. XII. p. 82.) The present number contains plates and descriptions of three species of this genus, the validity of two of which has been questioned by Mr. Elwes. Plate I. illustrates the complete life history of *A. Alecestis* by which it is shown that not only is it distinct in the imago state from both *Aphrodite* and *Cipris* but also in its preparatory stages.

Plate II. *Argynnис Adiante* (male and female). This is a local Californian species of which Mr. Elwes had only male specimens taken many years ago—from what material he had he was inclined to regard it as merely a variety of either *Zerene* or *Monticola*. It appears, however, that it is not such a rare species as he supposed, and Mr. Edwards had ample material to show that this species is valid. The male is figured from Dr. Boisduval's actual type. Dr. Behr, the well-known San Francisco lepidopterist, writes of it that it is common in its season at the proper locality, and further that unlike many Californian *Argynnides* it is very constant. On the same plate as *A. Adiante* is figured another interesting species *A. Atossa* (n. sp.) the male of which has been in Mr. Edwards's collection for twenty years; but the female was only discovered in 1889. From the figure it appears to be very distinct from anything we have in our fauna.

Plate III. shows *Satyrodes Cunthus* in great detail. The text of this plate is very complete. Mr. Edwards has adopted Mr. Scudder's genus for this species but believes the name *Eurydice* does not belong to it.—J. F.

THE CAVE FAUNA OF NORTH AMERICA, with remarks on the Anatomy of the Brain and Origin of the Blind Species. By A. S. Packard, M.D. Vol. IV.; First Memoir—National Academy of Sciences. 4to., pp. 156.

The author of this admirable volume is everywhere known throughout the scientific world from his numerous works, especially on entomology, and has obtained a deservedly high reputation in Europe as well as in America. This reputation will, we are confident, be, if possible, enhanced by the elaborate monograph before us. It contains many original observations of cave animals, some careful scientific investigations, and a very interesting chapter of philosophical

considerations. It is also fully illustrated by a map of the Mammoth Cave in Kentucky, a number of wood cuts and a series of twenty-seven beautiful lithographs, nearly all of them drawn by the author himself. The work begins with a description of the Mammoth Cave and others in the neighbourhood, and gives lists of the various animals found within them; an account of the Wyandotte and other caves in Indiana, Clinton's Cave in Utah, and one in Colorado; a discussion of the geological age of the caves and their inhabitants, the mode of colonization and the source of their food-supply. The second chapter describes the vegetable life of the caves, which is naturally of the most meagre description. Then follows a systematic description and list of the invertebrate animals found in North American caves, among which spiders are the most numerous. Insects are represented by eight species of Thysanura, four of Orthoptera, two of Platynptera, ten of Coleoptera and nine of Diptera—a by no means extensive list, but one that includes some very curious and interesting forms. The beetles of the genus *Anophthalmus* are especially remarkable and attractive to the ordinary entomologist. Lists are also given of the European and North American cave animals, and of the blind, eyeless creatures which do not live in caves, and which, strange to say, almost equal in number their cavernous relatives. The next chapter gives a careful account of the anatomy of the brain and eyes (when partly developed) of certain blind Arthropods. The chief interest of the work culminates in the final chapter where the author discusses the origin of the cave species as bearing upon the theory of evolution. We have not space for any abstract of his views, which are well-deserving of study, but must refer the reader who desires fresh evidence on the subject of evolution to the work itself. We entirely agree with the author in his closing words: "In the case of too many naturalists the dogma or creed of natural selection has tied their hands, obscured their vision, and prevented their seeking by observation and experiment to discover, so far as human intelligence can do so, the tangible, genuine, efficient factors of organic evolution."—C. J. S. B.

AMERICAN SPIDERS AND THEIR SPINNING WORK. A natural history of the Orb-weaving Spiders of the United States, with special regard to their Industry and Habits. By Henry C. McCook, D.D. Vol. I. Published by the Author, Academy of Natural Sciences of Philadelphia, 1889. 4to, pp. 372.

The author of this sumptuous volume is so well known from his valuable and interesting works on the natural history of various kinds of ants, and his charming little book "The Tenants of an old Farm," that any productions of his pen are looked forward to with lively anticipation and keen interest. We are quite sure that no one of the subscribers to this, his latest and greatest work, has been in the least degree disappointed by this first volume of the promised three. Though spiders are not insects, we have no doubt that every entomologist, and indeed every lover of natural history in any of its departments, will deeply enjoy the perusal of this volume. We cannot give a better idea of its contents than by mentioning the subjects treated of. They are, first, the general classification, structure and spinning organs of spiders; the construction and armature of Orbweavers' snares; the characteristic forms and varieties of snares; unbanded orbs and spring snares; the engineering and mechanical skill and intelligence of spiders; their modes of procuring food and habits in feeding; their fangs and poison bags; their modes of nest making and its development in various tribes; and finally the "genesis of snares." All these different subjects are fully illustrated with more than three hundred and fifty wood cuts. The second volume is to treat of the mating and maternal instincts, the life of the

young, the distribution of species, etc.; and the third will be devoted to descriptions of the orbweaving fauna of the United States, with coloured illustrations of a number of species. The whole will form one of the most complete works of the kind in the English language. Entomologists will need to have long purses if they wish to possess all the literature of the day, and to procure for themselves such costly and beautiful books as Scudder's and Edwards's Butterflies and McCook's Spiders. We trust that all who can possibly afford it will aid the authors in their self-sacrificing enterprises by subscribing for their books, but those who cannot do so should use their influence with their local Scientific Societies and Public Libraries and induce those in charge to purchase these valuable works for the general benefit. We are glad to say that the Public Library in Toronto and our Entomological Society have set a good example in this respect and rendered these works available for many of our readers. C. J. S. B.

REPORT ON INSECT AND FUNGUS PESTS. No. I. By Henry Tryon, Assistant Curator of the Queensland Museum. Published by the Department of Agriculture, Brisbane, Australia, 1889. 1 Vol., 8vo., pp. 238.

We have perused with great interest this first work that we have seen on the Economic Entomology of Australia. Some of the pests referred to are very familiar to us here, for instance, the Codling Moth and the Woolly Aphis of the apple tree, while others are species closely allied to those which are very destructive with us. The report takes up different fruits, vegetables and field crops that are most commonly cultivated in the colony, and describes the insects which especially attack them: as far as possible the life history of each pest is given and remedies are suggested. The work is very carefully and thoroughly done, and will, no doubt, be of great value to the fruit growers and farmers in that part of the world. Its usefulness would of course be greatly enhanced by illustrations of the insects treated of, but evidently there were difficulties in the way of procuring these that could not at first be overcome. Future reports will doubtless be made popular in this way. The author deserves much credit for the valuable book he has produced. We trust that the Queensland Government will give him all the assistance and encouragement possible in the prosecution of his studies in practical entomology, and enable him to continue a work that is of the utmost economic importance.—C. J. S. B.

THE BUTTERFLIES OF INDIA, BURMAH AND CEYLON. By Lionel de Nicéville, Calcutta. Vol. 3. 12+503 pp. 6 pl. 1890. 8o.

Some three years or more ago, we noticed a work on the above subject by Marshall and de Nicéville, of which two volumes had been published, the last by de Nicéville alone. A third volume of over 500 compact pages has just come to hand, the most notable thing about which, at least to a dweller in temperate regions, is that it is wholly concerned with the Lycaenidae, of which eighty-two genera and over four hundred species are described. Such wealth in these pygmies among butterflies is a striking fact. The author, however, beyond the generic collocation has made no attempt to classify this immense assemblage, contenting himself with only distinguishing certain groups of genera by the name of one of the included genera, as the "Thecla group," etc., which groups are characterised in a general but not formal way in the body of the work. These agree tolerably well with the groups Doherty had previously characterised from the egg alone, but are about twice as numerous and are established mainly upon the

structural features of the imago. This is better than Distant's artificial divisions but there is plainly an open field here for investigation, and one which there is apparently no need for great delay in occupying, since (excepting the egg) the early stages of Lycaeninae appear to offer less service to the systematist than in any other group of butterflies.

What will surprise one in this volume, is the very considerable addition to our knowledge of the early stages of the Lycaeninae, for excepting the Hesperiidae this group is in general the least known of butterflies. Yet something is recorded of no less than thirty-four genera, much of it new, and in many a good deal of interesting history is related. This is a great improvement on the preceding volumes. One particular case, that of the pomegranate butterflies, whose history was briefly and partially given by Westwood, seems valuable enough to reprint for the benefit of American readers; and another, *Curetis thetis*, may well be mentioned here:—"The twelfth segment [of the larva] bears two most extraordinary structures, which consist of two diverging, cylindrical, rigid pillars, arising from the subdorsal region and of a pale green color. When the insect is touched or alarmed, from each pillar is everted a deep maroon tentacle as long as the rigid pillar, bearing at its end long parti-coloured hairs, the basal third of each hair being black, the upper two-thirds white. The maroon tentacle with its long hairs spread out like a circular fan or rosette is whirled round with great rapidity in a plane parallel to the body, its use being almost certainly to frighten away its enemies, as this larva, as far as I am aware, is not attended by protecting ants and lacks the honey-gland on the eleventh segment present in so many lycaenid larvae which are affected by ants."

Ants have been found attendant upon half a dozen genera, and in many cases they have been identified by Dr. A. Forel, of Switzerland. At least a dozen species are concerned, and they are about equally divided between the Formicidae and Myrmicidae.

Spalgis, it appears, is another instance of a carnivorous lycaenid comparable to our *Feniseca*, the larva associating with and feeding upon the "mealy bug" of the planters, a species of *Dactylopius*. De Nicéville in no way favours Edwards's belief that *Feniseca* belongs to the *Lemoniinae*, and adds nothing, as we had hoped he might be able to do, to Holland's suggestions that *Liphyra*, too, might be carnivorous, though he points out that the two genera differ in their perfect state in the number of subcostal nervules, and are therefore not so closely allied as Dr. Holland thought.

The seasonal dimorphism of many Indian Lycenidae is well brought out, the dry and wet season taking the place of our spring and summer; indeed, it occurs in no less than eighteen genera, and this will be a revelation to many, and seems to bid fair to renovate the study of tropical butterflies. But while in India proper "the seasonal forms seem to be chiefly restricted to two, a wet and a dry," in the Himalayan district of Sikkim "the dry season form which occurs at the end of the year differs somewhat from the dry season form which occurs in the spring, so that with regard to some species there may be said to be three forms—a spring, a wet season, and a winter form." Sexual dimorphism on the contrary is very rare among tropical Lycenidae, de Nicéville stating that he does not know positively of any case, though he suspects it in a species of *Zephyrus*. On the authority of Doherty (a native of Cincinnati by the way, working most industriously in the east), he credits half a dozen or more species as mimicking others of the same or neighboring groups of Lycenidae. Much attention is also paid to the secondary sexual characteristics so far as their gross appearances are concerned, and they are noted in no less than nineteen genera.

Finally, we may call attention to the very interesting general chapter on the Lycaenidae at the beginning of the volume, which is of more than usual interest and rather exceptional in a work of this kind. The work itself must serve a very useful purpose; its execution is remarkably even and shows great skill and balance on the part of the author. There are half a dozen plates like those of the former volumes and executed by the same parties, excepting that two of them are chromo-lithographs, but we could wish that some plates of the early stages might have been added, and the direct purposes of the book for the Indian student would have been served by others giving structural details. —S. H. S.

MANUAL OF INJURIOUS INSECTS AND METHODS OF PREVENTION. By Eleanor A. Ormerod, Second Edition, 1890.

The enlarged and thoroughly revised edition of Miss Ormerod's Manual of Injurious Insects which has lately appeared, is a work of such importance to all engaged in agricultural pursuits, that it is thought well to place a notice of it in our Annual Report so that such of our readers who have not seen it may know of its publication. We feel confident that a perusal of this work would well repay all those engaged in the cultivation of farm, orchard or garden crops. The study of economic entomology has made great progress during the decade which has elapsed since the appearance of the first edition of Miss Ormerod's Manual in 1881, and this progress is to a large measure due to the unceasing labours of this talented lady. Her annual reports are eagerly looked for by thousands of farmers in Great Britain and by scientific students in all parts of the world. They give a concise account of the insect attacks which have occurred in the British Isles during the year which has followed the issue of the previous report. A feature of these reports is their practical nature, every attention being given to the best, not the largest number of remedies for each insect mentioned. This character is also very manifest, as might have been expected, in this more important work of Miss Ormerod's. There is no writer upon the practical science of combating the ravages of insects which attack crops, in Australia, India, South Africa, the United States, Canada, or elsewhere, who does not quote her opinion as the highest authority upon any subject which she has written about. This is due to the careful and thorough manner in which all of her investigations are carried out. In the last number of "Insect Life" issued by the United States Department of Agriculture and edited by the highest living authorities upon economic entomology, the following complimentary notice of this work appears:—"On account of its convenient size, admirable arrangement, plain language, and abundant illustration, it is almost a model of what such a work should be."—"Miss Ormerod's work cannot be too highly commended."

Now the merits above enumerated are just the points which render this work so valuable, for it is perfectly intelligible to anyone who can read, and thus becomes almost indispensable to every farmer, gardener, or fruit grower, who would carry on his work in the most successful manner. Nor is this the case in England alone, where the work was written, for so many of the actual insects treated are common as agricultural pests both in Europe and in North America, and moreover the general principles recommended for the prevention of injury are applicable all the world over. Besides this from the fact that most of our most injurious insects are imported species, we know not at what moment any of those so well treated of in this work, may not appear in our midst as a serious tax upon our cultivated crops. The different kinds of attacks are arranged alphabetically under the three headings, Food Crops, Forest Trees, and Fruit. Some new attacks not mentioned in the first edition and which appeared sub-

sequently to its issue, are now paid particular attention to, amongst these are the Hessian Fly, Stem Eel-worms and the Wheat Bulb-fly. The information concerning all the attacks treated of in both editions has been largely augmented and the special subjects of Wireworms, Turnip-flea-beetle, Mustard Beetle, and Hop Aphids are entered on at length.

Special attention has been given to the presentation of the latest developments in the way of preventive measures. Attention is drawn to the use of chemical manures which are highly beneficial as plant-stimulants (but by no means so to vegetable-feeding grubs and maggots), and the many kinds of agricultural implements, by which the soil can be more completely broken up on the surface, or the surface more thoroughly buried down than was formerly the case, these are of great assistance to us. As an Appendix to the Manual is given a short and copiously illustrated "Introduction to Entomology," where, in the plainest possible language, the structure and changes of insects are described, and illustrations and definitions of the various natural orders into which they are classified are given, so as to "enable the observer of a crop attack to tell at least what kind of insect is before him," and also "in the list of the orders of insects, notes are given of the most observable of the characteristic points by which the insects composing these different orders may be distinguished from each other."

A glossary of terms and a full index render this work very complete. It contains 410 pages, and is illustrated with 155 excellent figures, many of them from the authoress's own pencil. The frontispiece is a portrait of the authoress which has been prefixed by desire of many friends and will be of interest to many in this country who have not had the pleasure of meeting Miss Ormerod. The manual is well printed, neatly bound in cloth, and the small price at which it is published (\$1.25) brings it within the reach of all.

There are many articles in the manual which are of interest to Canadian readers as they describe insects which also occur here—amongst these the following may be mentioned :

THE BEAN WEEVIL (*Bruchus granarius*).—Treating the seed with a solution of sulphate of copper and carbolic acid are recommended, also soaking the seed beans for some time before they are sown, or dropping them for one minute into boiling water.

THE CABBAGE APHIS (*Aphis brassicae*).—In garden cultivation drenching the infested plant with soap-suds is practicable, syringing with an infusion of tobacco in lime-water has been found useful and dusting with caustic lime and soot are stated to be very effective in getting rid of the aphis.

THE SMALL WHITE CABBAGE BUTTERFLY (*Pieris rapae*).—The greatest confidence seems to be placed in strengthening the plant, so as to enable it to outgrow the attacks of the caterpillars. In this country this is insufficient and undoubtedly the best remedy is pyrethrum powder reduced with 4 times its weight of common flour or finely sifted lime and then dusted over the plants.

CABBAGE FLY (*Anthomyia brassicae*).—The use of barn-yard manure immediately before a cabbage crop seems to induce attack, also the continuous cultivation of cabbages on the same ground. The value of lime and ashes are emphasized by the experience of correspondents.

CARROT FLY (*Psila rosa*).—This is an uncommon insect in Canada; but is found here and is liable at any time to develop in numbers. The remedies suggested consist chiefly of, careful cultivation of the soil so as to induce a vigorous growth, care at the time of thinning the rows and the use of obnoxious materials to deter the females from egg-laying.

STEM EELWORM (*Tylenchus devastatrix*).—“Clover sickness” and “Tulip, root” in oats are caused by small nematode worms. We have not so far observed these in Canada, but they have been studied in the United States and we should be on our guard. Some points in the life-history of the species are given in regard to which some common-sense remedies are suggested, such as not planting a crop liable to attack upon infested ground. It is shown that several plants are injured by the worms and that they can survive the operation of digestion in animals fed on infested fodder. It is the same species which causes stem-sickness in clover and “tulip-root” in oats. Grain Aphid *Siphonophora granaria*, Kirby. Early maturing varieties of grain are recommended. The full life-history of this insect is still unknown.

DADDY LONGLEGS (*Tipula*).—These troublesome insects are treated at some length. Amongst measures to be taken to lessen the quantity of eggs laid, are mowing down coarse vegetation in places suitable for the females to lay eggs, and feeding sheep on infested pastures. Draining of low land and the use of quick-acting fertilisers are suggested.

HESSIAN FLY (*Cecidomyia destructor*).—This well known pest has been specially studied by Miss Ormerod. The chief remedies are burning infested stubble and screenings, the selection of varieties least attacked, and the use of special fertilisers in the spring to strengthen injured plants.

WHEAT MIDGE (*Cecidomyia tritici*)—Deep plowing directly after harvest and the destruction of screenings seem to be the best remedies.

THIRPS (*Thrips verecundum*).—Deep ploughing and clean farming are thought to be the best remedies.

WIREWORMS (larvae of the Click Beetles).—“Wireworms may perhaps be said to do the greatest amount of mischief of any of our farm pests; they destroy root grain and fodder crops.” So Miss Ormerod begins her article and it is almost as true for some parts of Canada. Great stress is laid on the preparation of the land before a crop liable to attack. Autumn feeding with sheep and the use of gas-lime and salt are highly spoken of. Sir Richard Keene writes “If the lea is broken for oats (our general crop) it is sure to be attacked more or less by wireworms; I top-dress with 4 cwt. agricultural salt, 2 cwt. superphosphate and sometimes 1 cwt. nitrate of soda. I have never known this to fail if applied in time. If the lea is broken in autumn, to have green crops in the following year, I have the land worked as much as possible and apply 8 tons hot lime to the statute acre; lime as hot as possible. I always sow the seed with a liberal dressing of farmyard dung, for such crops as mangold, turnip, cabbage, carrot, and parsnip, and I use the following dressing of artificial:—2 cwt. best bone meal, 1 cwt. nitrate of soda, and 3 cwt. common salt. I find the plants are soon forced up beyond the reach of damage.

HOP APHIS (*Pherodon humuli*).—This is another insect which sometimes does enormous injury in Europe, and which has received particular attention from both the authoress and Prof. Riley whose studies have supplied important links in the life-chain of this insect. The remedies most to be relied on are the treatment of plum trees early in the season to destroy the first brood of aphid and afterwards “washing or spraying the hop plants when they are found to be infested.

RED SPIDER (*Tetranychus telarius*).—This is another of the dire enemies of the hop as well as many other plants. Washes containing sulphur or kerosene are suggested.

MANGOLD OR BEET FLY (*Anthomyia balea*).—The remedy most spoken of is high cultivation; but the benefits of a kerosene emulsion are suggested by the experience of one of the correspondents quoted.

ONION FLY (*Anthomyia ceparum*).—The remedies offered for this well-known pest are careful preparation of ground which has not borne onions the previous year, growing them in trenches so that the bulb may be kept covered, the removal of diseased bulbs, and the treatment of infested plants with what is practically a kerosene emulsion or simply with soap suds.

SLUGS.—These troublesome mollusks are not insects but are treated in the manual because so frequently sent in by people who suppose they are. Gas-lime, lime, and salt if applied frequently at short intervals are sure remedies.

THE DIAMOND-BACK MOTH (*Plutella cruciferarum*).—This insect frequently so injurious to cabbages in this country is spoken of as an occasional pest of turnips. A dry dressing of gas-lime, one bushel; lime from the kiln, one bushel; sulphur, 6 pounds; and soot, 10 lbs., was found useful.

In Part II. "Forest Trees and the Insects that injure them," there are no insects which actually injure our forest trees in Canada although the general principles of prevention and remedy give valuable suggestions.

In Part III. "Fruit Crops and Insects that injure them," we find many too well known enemies of the orchardist.

THE WOOLLY APHIS (*Schizoneura lanigera*).—Of the many remedies given it seems to us that the treatment of the stem inhabiting form with soap-washes or kerosene emulsion will be the most effective, and the latter is probably the best remedy for the root inhabiting form which is so difficult to reach.

APPLE APHIS (*Aphis malii*).—Syringing with soft-soap and other washes is recommended.

CODLING MOTH (*Carpocapsa pomonella*).—Scraping, banding, and washing the trees, form the chief remedies. Spraying with Paris green. This is the first mention of this now universally used American remedy. Up to last year Paris green as an insecticide was unknown in England. Now however at Miss Ormerod's suggestion it has been tried and has proved so successful that there is no doubt that it will rise rapidly in public favour. Probably some from carelessness or recklessness, in not following the instructions closely, will put on the washes too strong and injure the foliage; but the benefits which will follow its adoption will be so enormous that Miss Ormerod will speedily be recognised as a public benefactor by thousands of the ignorant *educated* people in Great Britain who "did not know that grubs and creeping things were of any interest to them."

MUSSEL SCALE (*Mytilaspis pomorum*).—This is our familiar oyster-shell bark louse. The usual soap washes in spring and the mechanical removal of the scales are recommended.

GOOSEBERRY SAW-FLY (*Nematus ribesii*, Curtis).—Great stress is laid on the value of removing the surface soil from beneath bushes which have been infested by the larva. Mention is made of some mixtures containing soot or sulphur. We are surprised to find that "white hellebore" is not mentioned.

SHOT BORER "PEAR BLIGHT" (*Xyleborus dispar*).—A most complete article is given on this insect which has been very injurious in our Maritime Provinces for some years: preventive remedies in the shape of washes to prevent the females from laying eggs are given.

MOTTLED UMBER MOTH (*Hybernia defoliaria*).—This moth is interesting to us from the fact that it has been taken on three occasions in Vancouver Island by Rev. George W. Taylor—whether indigenous or introduced is uncertain.

This is one of several moths which have been very injurious for many years in England but which have been successfully treated during the past season with Paris green. A long article detailing the experiments of the Evesham Fruit Conference with Paris green, under Miss Ormerod's guidance, gives an account of the successful introduction of Paris green into England as an insecticide. J. F.

THE RUSSIAN PARASITE OF THE HESSIAN FLY.—Miss Eleanor A. Ormerod, the eminent consulting entomologist of the Royal Agricultural Society of England, in a communication to the *Mark Lane Express*, thus refers to the discovery of this parasite:—

"It is announced in the United States that Professor C. V. Riley, the well-known entomologist to the United States Department of Agriculture, has introduced into that country living specimens of *Semiotellus nigripes*, a Russian parasite of the Hessian fly, in order to acclimatize it. By its aid he hopes to practically exterminate the pests in that country. Curiously enough he obtained this parasite from England, and it is said that quite a number have been reared for the purpose. If this is the case, there should be no difficulty in the way of adopting the same means of getting rid of the Hessian fly in this country, and it would be interesting to have Miss E. A. Ormerod's opinion on the subject."

My opinion is that, quite certainly, it would be worse than useless (in this country) to make any such attempt. In the United States of America things are on a very different footing. There are differences in temperature, conditions of climate, and also of area of cropping, and other agricultural arrangements which must affect this question. Likewise there are special arrangements at the Government experimental stations for rearing insects, and skilled Government entomologists who can trustworthily examine the collections before they are turned loose on the country.

The parasite fly (the *Semiotellus nigripes*) is only about one line long, and without the help of a magnifying glass and some technical knowledge it would be impossible for any but skilled entomologists to be certain whether many pests were not included amongst the parasites which they set free. Also it is to be remembered for the most part insects pair, lay eggs, and die very shortly after they make their appearance from the chrysalids, but even supposing these minute creatures lived on awhile, where are they to be taken to?

We do not know what corn is infested until attack is thoroughly set up, for the most part till the mischief is so advanced that the time for action of the parasite is past; and at a vast expense the intended destroyers would in many cases be carried where there was nothing to destroy.

This work of rearing could not be done on a broad scale—that is, by collections from the threshing machine by farmers—and the payment to a staff of collectors, rearers, and distributors would involve enormous outlay.

The present plan of destroying the Hessian fly chrysalids in the fine screenings is much the safest, and also has, for this country, the stated approval of Prof. Riley himself. It is easily done, costs scarcely anything, and causes no loss; and thus, though we destroy the parasites (of which there are several kinds), we also quite certainly destroy the pest.



SMITHSONIAN INSTITUTION LIBRARIES



3 9088 01271 1198